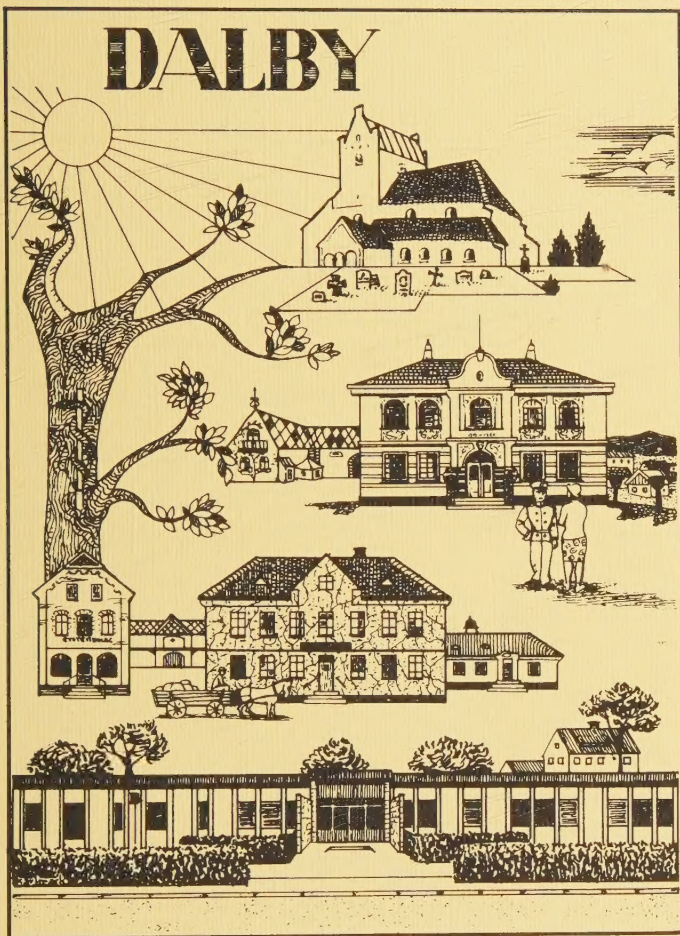




DATA SYSTEMS IN HEALTH PLANNING

*An evaluation of population-based data
systems as tools for health planning*

Thor Lithman

in cooperation with

Inge Dahn and Bengt Scherstén

Lund 1982



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An evaluation of population-based data systems as tools for health planning

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Abstract Computer based systems for the registration of contacts in inpatient and outpatient care have existed for several years at the Malmöhus County Council. Since public medical care accounts for the greater part of medical care in Sweden, these registrations cover the majority of patients' contacts with the health care organization. This study was carried out in order to investigate the usefulness of the data systems as tools for health planning. This kind of planning requires population- and individual-related data. The systems can provide such data but their primary purpose is to give production-related data. They have not been created primarily for the purpose of reflecting health consumption and occurrence of illness in the population. The evaluation of the statistical systems demonstrates that: - the systems provide a basis for health planning through studies of consumption of services and occurrence of illness - the quality of the data ought to be raised, especially for information about place of residence and diagnosis - the systems allow information to be linked with the help of person-number - methods for the linkage of information must be specifically designed for different diseases - linkage with the population register is possible, and would be of even greater value if coordinates were used - sub-registers should be created for certain chronic diseases - supplemental information should be obtained from other sources, e.g. the cause-of-death register and private practitioners.			
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1982-09-09

From the Department of Community Health Sciences, Dalby, University of
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An evaluation of population-based
data systems as tools for health
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by

Thor Lithman

in cooperation with

Inge Dahn and Bengt Scherstén

translated by

James F Bergseng

Lund 1982

The cover design has been drawn by Gerhard Karlmark. It represents the church, the council house, the inn and the health care center in Dalby.



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To
 Margareta
 Johanna and Charlotta

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I INTRODUCTION

1 BACKGROUND

Computer based systems for the registration of contacts in inpatient and outpatient care have existed for several years at the Malmöhus County Council. These systems have been used primarily to study the production of services in various units. Only to a limited extent have they been used to study the consumption of services and still less in the study of occurrence of illness.

The national government's draft for a new law on health and medical care (1), states that "Alongside pure medical research, there have also been developments for the direct purpose of simplifying the planning of health and medical care as well as other organizational processes in medical care. This type of activity, usually referred to as health and medical care research, is still rather limited. Epidemiological studies, studies of demand for and consumption of medical care services, studies of the availability of resources, their structure and utilization, and evaluative studies, are usually regarded under this heading." The present study also comes under the same heading.

In this study, various methods are tested, making use of statistical systems to analyze the consumption of medical care services and the occurrence of illness. The purpose of the study is to provide a basis for the guidance and continued development of such systems in Malmöhus County. It is also intended to support the evaluation and construction of statistical systems already in existence or being planned by other county governments.

Limitations

Our testing of the statistical systems has been limited to the field of somatic, short-term care, except for certain outpatient, psychiatric diagnoses and visits to psychiatric units, which have also been included. For somatic, chronic care and psychiatric care, which often require long periods of treatment, other methods than those used in the present study are probably needed.

Abbreviations and definitions

The established abbreviations for the statistical systems are PAS-SV and PAS-ÖV (Patient Administrative System for inpatient and outpatient care, respectively). The term "Statistical System" is used as the collective name for all constituent sub-systems, since their common purpose is the collection and presentation of statistics. The period from date of admission to a clinic until date of discharge from the clinic is called care episode. Visits to a health service unit are, by definition, outpatient visits and, if not otherwise stated, to a physician. "Register" is used to indicate a source of registered data, while "registry" is used exclusively to indicate the responsible organization or place, where a register is maintained.

Sources of demographic and medical data

The first recorded population census was carried out in China in A.D. 754 (2). Modern censuses have been in use for about 200 years. Swedish population statistics were founded in 1749, when responsibility was assigned to local pastors for the periodic reporting of statistical tables for the parish, including counts of population by sex, age and occupation, as well as annual tables of births, deaths and marriages (3). These reports were based upon a written ledger called the parish register, which, since 1686, had contained continual notations on the status of the population and its changes.

"The Swedish population register is of purely ecclesiastical origins, since it was created by the church itself, as an aid to its spiritual mission. The present parish register has its original impetus in the church law of 1686, which required of the parish priests a ledger of mandatory, information gathering visits in the homes of residents, arranged by city block and dwelling, and including notations on churchly functions. In later times the parish register has come to be regulated under special rules.

"...Due to a reform of 1946, the population register has come to consist of three parts: the parish register, the residence register and the central registers maintained by provincial agencies and by the National Central Bureau of Statistics.

"According to rules applied since 1974, the parish registration is maintained on a current basis by the pastoral authority and on an annual basis by the local revenue offices in the form of residence ledgers arranged by parish for each commune. Residence registration, which earlier occurred once a year, is now kept current automatically through the mandatory report of change of residence. The governing rule of population registration is that each individual is to be registered in the parish where he resides. For each person a record is maintained, which contains name, person-number, place of birth, membership in the Church of Sweden, citizenship and civil status. On change of residence, the file is transferred to the new parish office.

"The parish register contains such information in coded form for data processing and is prepared by the provincial data processing department on the basis of reports from the pastoral authorities, which in turn are based upon the mandatory change-of-address notice. Ordinarily this is accomplished when a copy of the resident's notice, which he submits to the Post Office, is forwarded to the Pastor's Office.

"The provincial population register is now entirely based upon automatic data processing. The main register, at this level, is sorted by person-number and includes for each person certain data reported by the Pastoral Office, local revenue offices, the public insurance system, military and civil defence authorities etc. The central population register, maintained by the National Central Bureau of Statistics (SCB), is built up of material received from the provincial data offices." (4).

Information in the population register is identified by person number. "This consists of the two final digits of the year of birth followed by month and day of birth and a three-digit birth-number (001-999) as assigned by the provincial authority, whereby a unique series of numbers is used by each province, made up of odd numbers for males and even numbers for females. The tenth digit of the person number is a check-digit, generated by algorithm from the other nine digits, which facilitates a rapid check on the correctness of the number in subsequent use. The population register number is always, unlike the name, a unique identifier of the individual." (4).

Since 1860 the Swedish census has been carried out every tenth year by the National Central Bureau of Statistics (5). In this connection, persons were counted by the Pastoral Office with the help of files on record in the Parish. In addition, population changes were counted using the church ledgers and the new population could be determined. But since 1974 the census has been based upon data retrieved from the Bureau of Statistics' register of the total population, while data on population changes are based upon reports received each week by the Bureau from provincial authorities (6).

During the 1700's there were instructions to the provincial and city doctors to contribute to a general medical topography and statistics for the entire country, and they were strongly encouraged to correspond regularly with the Health Collegium regarding the state of health of the country (7). During the 1850's detailed regulations were introduced for the reporting of epidemic diseases by doctors. From a report for the year 1870 (8) we have the following quotation regarding Malmöhus County: "The newly formed district of Skurup is made up of the parishes of Skurup, Slimminge, Örsjö, Solberga and Haslebösarp, which are located in the township of Wemmenhög and comprise the northeastern corner of the same. It has a population of between 6 and 7 thousand persons. The countryside is flat with here and there a number of lesser heights and forests in the northern parts. Within the district lie several larger manor houses, such as Svaneholm, Brädda, Skönabäck, Ryssgård, Thorsjö etc. Most farms are bordered by plantings of trees. The distance to the sea is 10 kilometers and to the nearest city, Ystad, somewhat exceeding 20 kilometers and to Anderslöv, where the district doctor resides, and to which the district formerly belonged, nearly 20 kilometers. The soil is for the most part rich and fertile and here and there are found larger or smaller peat-bogs. Agriculture follows the most modern methods by means of draining and treatment with marl. Näsbyholm Lake, located at the western edge of and, in part, within the district, was drained about two years ago and presents, during the greater part of the year, the picture of a meadow, which has produced an abundant harvest of hay that was purchased with great eagerness by nearby residents and in this manner raised the fertility of their land. Foods are generally of good quality, consisting both of beef and of pork. The primary beverage is "dricka" or beer. Coffee is widely used, most often with the addition of chicory; spirits or rum are frequently added for the men. Spirits are not consumed to any marked degree of excess. Workers often consume much food at one time, although this same is not usually so rich but consists mostly of potatoes and herrings, either salted, in wintertime, or fresh in the summer, with sour bread and warm fermented beverage or sour milk as soup. The humor is most often phlegmatic. Thriftiness, due to a strongly

ingrained egoism, is a distinguishing trait among the local farmers; there is a general state of well-being. Celebrations are customary at Christmas and other holidays, and on such occasions neither food nor drink are spared. The costume of the men is not particularly remarkable, since it has approached that of the marketing town residents. Women's clothing is mostly home-woven and consists of wool and linen; on festival occasions they use a rich, silk costume. On their head they may wear 4 or 5, yes! even 6 different bonnets. The homes of the common people consist of several rooms, of which only one or two are in daily use, and in wintertime are heated by means of an iron stove. Chronic stomach inflammation and acidity are common endemic illnesses, depending upon the way of life. Neither are scrofula to be regarded as rare, occurring in the form of eye and ear inflammations."

Since 1749, the pastors were expected to record the causes of death for deceased persons, according to a specified list of 33 terms (7). These were summarized according to age and sex and, as an example, it can be cited that for infants under 1 year, in the kingdom as a whole during 1751, there occurred 9,133 male deaths and 7,033 female deaths. Of these, 2,174 deaths were due to pox and measles (3).

Before the 1950's cause-of-death statistics were the primary source of current information on the illness-panorama. Thereafter registers were created for the reporting of cancer and results of gynecological tests. This marked a shift of interest from fatal diseases toward the need for better information about the causes of the increasing demand for health-care services (9).

Computer registration of inpatient care was introduced in the early 1960's. The report by the National Central Bureau of Statistics (9) contains a description of the material, methods, development and content of the statistical system. According to this report the then existing Medical Board argued that these statistics should make it possible to study that part of the illness-panorama that is reflected in the inpatient care system.

Computer registration of inpatient care ought to be able to replace the annual medical narrative reports that were previously submitted to the National Board of Health and Welfare. In these, each clinic turned in annual data on the number of cases admitted for diseases, injury by violence, number of deaths and the number of operations performed on admitted patients. The reports were replaced by magnetic tapes containing individual-related patient statistics.

Computer registration also provided a basis for the annual narrative, which included data on the number of patients cared for at the various clinics. Information had previously been collected manually. For outpatient care, the information was also summarized manually, including among other things the number of visits to public care units. Information about private medical care was collected from doctors registered with the public insurance system. A more detailed collection of statistical data was made in local test projects, as for example in the report on production at the Örnköldsvik outpatient clinic, the Tierp project and also in care planning at the Health Care Center at Lerum (7). Activities at the Health Care Center in Dalby have been registered since 1968 (10).

The obligatory annual narrative reports to the National Board of Health and Welfare were replaced toward the end of the 1970's by reporting within the framework of the long-term economic planning of the county councils. This contains, among other things, data on the number of patients admitted, care-days and visits during the year at the various clinics.

There are also other sources in Sweden, which illuminate the illness profile of the population. Examples of these are studies on the standard of living, the registration of birth defects and of medical data at birth, sick-leave registration and the register of early retirements (11).

Changes in the planning process

In the field of health and medical care, the demand for a fully developed research program, as proposed in the government's new bill (1), has further implications for planning.

A comprehensive, high level planning for health and medical care in Sweden was under way during the 1970's. Plans were worked out, both centrally and by local organizations, primarily directed toward the structure of health and medical care organizations. Health and medical care were to be organized on three levels: primary care, county medical care and regional medical care, with primary care as the basic element (12).

Discussions of objectives were subsequently taken up in the plans, mainly in terms of how the health and medical care system should function in order to meet the demands for an organization capable of responding to the needs of the population. Continuity of care, nearness, and total view of the patient are examples of these terms of reference (13).

When the structure had been decided upon and objectives discussed, the necessary prerequisites for an attack on society's health problems had been formulated. This concept was called health planning (14).

The distinction between health care planning and health planning is explained in the applicable literature as follows:

"They differ not only in their range of purposes but in their instrumental pathways. Health planning operates through modifying any or all of the determinants of health, including the physical and social environments and patterns of individual and group behaviour, as well as through the personal health services. By contrast, health care planning focuses on the latter, attempting to select volumes and configurations of facilities, personnel, technologies, equipment, and services which will best meet the needs of defined populations within limits imposed by resources and acceptability." (2).

New demands on statistical systems

Changes in the planning process also effected the formation of statistical systems in health and medical care, while advances in computer technology made it possible at the same time to collect and process large masses of

data. It was therefore only natural that new systems for the collection and processing of statistical data should be developed, which would provide a much more detailed picture of the functioning of the organization than had been possible with the manual registers. It was also natural that these systems should be developed primarily for inpatient care, since hospital planning was the most pressing need. Routine statistical systems for inpatient care were gradually introduced in several counties (9).

Since planning for outpatient care was still limited, the pressure for statistics in this area was not as great. Therefore, such systems as were developed for computer processing applied to only a few care units.

In- and outpatient systems were used in the planning process for health and medical care. Since a shift was also taking place from resource planning alone toward a combined need-and-resource planning (15), new demands were also made on the statistical systems. This process still continues, but now also requiring a clear description of the state of health of the population, thereby underlining the present striving toward systems that will be capable of supporting the kind of planning that responds to the broader areas of responsibility of the health and medical care organizations.

The statistical systems for inpatient somatic and psychiatric care are hospital based. These, along with the outpatient systems, are useful in the description and analysis of production in the various care units. Since the systems now in use in Malmöhus County include personal data and medical information, they can also contribute to our knowledge of patterns of illness and the population's demand for care services. Epidemiological descriptions also become possible. Epidemiology is here defined as the science of occurrence of illness, where illness is seen in relation to individual characteristics and surroundings (16).

A hypothesis to be tested in this study is that the statistical systems can be used effectively to describe the state of health of various groups within the population. Since it is illness that is registered, the state of health must then be measured not in terms of the occurrence of health but rather in terms of the occurrence of illness. Since each of these is a reflection of the other, an increase in the number of illnesses implies reduced health and vice versa. When measurement is made with existing registers, the result is valid only to the extent that illness leads to contact with the health and medical care services and that registration takes place. Such is not always the case (17). The difference between registered and real illness must therefore be taken into account. This study deals with registered illness, but examines the contribution of such data to our knowledge about real illness.

Health and medical care are provided at different levels and at different care units for one and the same population group. Descriptions of how care services are used and of illness patterns therefore require a material for which data collection and processing are unmanageable without the aid of comprehensive statistical systems, from which the data for various population groups can be selected. Such comprehensive systems have now come into use in Sweden. For inpatient care, these systems are now at work in several counties, which together account for approximately one million

care episodes per year (18). The earliest of these systems have been in use for more than 10 years; namely the so-called Uppsala and Skåne systems. There has been a computer based system for outpatient registration since 1977 in Malmöhus County and Malmö Commune. It has not yet been extended to other counties, but other local systems also exist, such as those in Dalby and Tierp, where the consumption of health care services has been under study for many years.

These systems are also used to aid the National Board of Health and Welfare in the preparation of its program-in-principle for the health and medical care of the 90's (19). Studies at the central level should, however, be combined with local studies, since the local connection gives easier access to such changes in the system as have occurred in response to demands by the care organizations. It is also easier to make use of other local information and to test the possibilities of augmenting the statistical systems. Still another advantage in working at the local level is that this provides a direct connection with the planning process at county level.

The demands of the planning process on the statistical system can be summarized in the following three steps of development:

- the demand for production-related data
- the demand for population-related data
- the demand for individual-related data.

Population-related data can be used in health care planning for the scaling and distribution of resources according to the size of the population, its characteristics and distribution of contacts with the health service at different units. Individual-related data can contribute to health planning through discussions about the directions of health and medical care services in relation to occurrence of illness.

International trends

As noted in a report by the World Health Organisation (20), "It should be noted that in many developed countries there are no complete and reliable data on morbidity, even though only such data can provide the basis for true planning of health care. Another point is that overall epidemiological studies on a scientific basis, covering a whole town, region or country, are very rare because of the difficulty of obtaining data and the cost of setting up the study."

In 1977 WHO-prepared an enquiry form about information systems in health and medical care, which was sent to 32 countries in the European region (20). The general situation was that only half of the countries had a development plan for their national health information systems. There was a need for valid information on the health status of population groups and on the utilization of services, especially primary care services.

The health situation and the health and medical care systems in European countries are described in another report (21). This report emphasizes the growing importance of epidemiology as a method for measurement of the health needs of the population and as a base for the determination of health priorities and for evaluation of health service activities.

These references show that also in other countries the importance of improved information systems in health and medical care is being emphasized. The present situation in six industrialized countries is described in a report on discharge statistics from hospitals (22). Countries were so selected that a number of different organizational patterns for health and medical care should be represented. The countries studied were Australia, Canada, England and Wales, Finland, France and Sweden. Some form of individual-related statistics are maintained by all of these countries except France.

In Finland individuals are identified by date of birth. Repeated hospital admissions can be traced to various hospitals and the complete patient history can be studied on an individual basis. Epidemiological exploitation of the systems has improved during recent years. The possibilities of using the Finnish register for individual-based studies are very good, due to the complete coverage of inpatient care.

In the remaining countries, except for France, the systems are used mainly for administration, planning and research. They have not been usable in routine production because of slow processing cycles. In England another system has therefore been introduced, Hospital Activity Analysis, which should give faster access to data (23).

In Denmark a system was developed during the mid-1970's for the registration of inpatient care. It includes a person-number. A report comparing medical care consumption between various communes made use of material from this system (24).

During the mid-1960's an individual-based system was introduced in two areas in England, the Oxford Record Linkage Study. This system contains coded information on birth, death, inpatient care and deliveries. Information about the individual is linked successively. In one study information was retrieved on various combinations of diagnosis for individuals having at least two discharges during a two- and five-year period, respectively (25). In another study, also based upon this register, patients were enumerated by illness and without regard to number of discharges with that diagnosis (26).

These examples have been mentioned in order to demonstrate that attempts are under way to establish statistical systems which can be used in individual-based studies.

The development of statistical systems in outpatient care is not as advanced as in inpatient care (2). Work is in progress, however, in many countries, such as Denmark, where the State Medical Research Council gave great importance to the continual registration of course of illness on an individual basis. In Great Britain many epidemiological studies have been carried out on occurrence of disease and the consumption of health care services (27).

The importance of health services research is increasing in many European countries (28). The creation of the European Advisory Committee for Medical Research and Health Services Research by WHO in 1977 is a further confirmation of this trend. The investigation and development of

medical information systems is included under health services research (21). In this connection, Sweden, to a greater extent than most other countries, can take advantage of its extensive population statistics.

II AIMS OF THE STUDY

The overall objective of the present study is to evaluate the potential usefulness of existing statistical systems at county level as a basis for health planning, and further, to obtain experience for the continued development of statistical systems.

The specific objectives are:

- to evaluate the quality of the statistical systems
- to evaluate methods for the analysis of patient-contact patterns in time
- to evaluate methods for identifying episodes of illness in connection with the calculation of incidence and prevalence statistics
- to evaluate methods for the analysis of geographic differences in the incidence and prevalence data of various population groups.

III MATERIALS AND METHODS

1 CONCEPTS, DEFINITIONS AND TOOLS

Some familiarity with the health and medical care organization, and with the population base in Sweden and in Malmöhus County, is necessary for an understanding of the present study. Since the Ystad Medical District is treated in greater detail, that area is also included in this background description.

Certain concepts are subject to varying interpretation; the concepts of information and information systems in health and medical care must therefore be defined for use in the present study.

Statistical systems in Malmöhus County are described in terms of their structure, content, forms, data processing routines, and classifications.

Health and medical care organization and the population

During the mid-1970's, WHO carried out a study of the planning processes for health and medical care in eight European countries, including Sweden. Central and local levels were studied in each country. Malmöhus County was selected for study in Sweden. The material was summarized in a report (29), from which the following excerpts are taken:

"Sweden is a parliamentary monarchy with a population of about 8 000 000. The functions of the crown are mainly confined to representation. The ultimate authority of the State is vested in Parliament, which since 1971 has consisted of a single chamber of 350 members who are elected every 3 years. Bills are referred to the appropriate parliamentary committee before discussion in Parliament. The government executive at the national level is the Prime Minister together with his Cabinet, which he appoints from among Members of Parliament. The collective responsibility of the Cabinet is policy formulation rather than policy execution, especially the preparation of legislation and of the national budget. ...

"The Government is represented at county level by provincial boards. The most important provincial board is the Governor's Office, which is responsible to the Ministry of Physical Planning and Local Government but administers the policies of various national ministries. The Governor heads the civil service administration office. He is appointed by the Cabinet and assisted by a 10-member lay board, half of whom are appointed by the Government and the remainder by the county councils. For some activities certain boards are directly responsible to their respective national boards.

"There are two civic levels of local self-government which are independent of each other. These perform well-defined functions under their own authority and also carry out tasks which the State has delegated to them. The State, through its national and provincial offices, exercises supervision over and gives guidance to self-governing and delegated activities.

"The number of primary divisions of local government (the municipalities or primary communes) has been gradually reduced from about 2,500 in 1950 to 278 in 1974. This reorganization was brought about to make their activities more viable. These activities include education, welfare support, the care of children, the elderly, and the handicapped, local construction, fire prevention, and various recreational and cultural activities. The secondary divisions of local government are the 23 counties or secondary communes.¹⁾ The largest task of the secondary communes is health, medical, and dental care.

"Primary and secondary communes have a council, i.e., basically a local parliament for decision making. The councillors are elected by the public every 3 years on the same day as the Members of Parliament are elected. The administration of the commune is by the executive committee of the council and various other more specialized boards and committees of the council.²⁾

"The communes are empowered to tax residents' income at a rate determined by their councils. Other revenues derive from grants-in-aid and subsidies from the State government as well as from charges and fees, rents and interest, real estate transactions, etc....

"There is a Swedish association of local authorities (primary communes) and a federation of Swedish county councils. Both organizations act as a national lobby, negotiate wages and working conditions for commune workers and officers, and carry out inquiries of various kinds....

"Malmöhus County is situated in the extreme south-west of Sweden.... It covers about 500,000 people, since it excludes the city of Malmö (population 250,000), which acts as its own secondary commune (county borough)....

"The Council committee most concerned with health services is the Health Care Board, which has local committees for the 6 health care districts.³⁾...

1) In addition, the primary communes of Gothenburg, Gotland, and Malmö act as secondary communes. They are also called county boroughs. This makes 26 counties in all.

2) Any member of a local community can complain about decisions by his local government to the Governor's Office. He can appeal to the Supreme Administrative Court of Sweden if he is not satisfied with the decision of the Governor's Office.

3) The County Council or Commune is divided into health care districts. These health care districts are further subdivided into small primary care districts, contiguous with primary communes in this county, where district physicians and nursing staff operate under the administrative supervision of the County Council.

"The County Commune¹⁾ has the responsibility for all health services, except for school, environmental, and occupational health care. The school health authorities usually have their own nursing staff, but employ county commune or private physicians on a contractual basis. A similar arrangement is under discussion for small firms."

The Ystad Medical District, which contains the three communes of Ystad, Skurup and Sjöbo, lies in the southeastern part of Malmöhus County, between 20 and 50 km from Lund. Medical care at district level has been placed at the Ystad Hospital, while county and regional services are placed at the hospital in Lund. Services available at the Ystad Hospital include medical and surgical clinics together with specialist services in pediatrics, orthopedics, gynecology, eye care, ear-nose-and-throat care and psychiatry. There is also an emergency reception ("drop-in") at the hospital, serving the entire district.

The hospital in Lund is a regional and university hospital, providing all forms of specialized care that are not available at other facilities within the county.

One of Sweden's earliest care centers is located in Skurup. This center came into use in 1967 and in 1980 was staffed by 5 district-doctor posts, of which 3 were tenure positions. This reception was open during daytime hours on weekdays.

No private physicians were practicing in Skurup Commune. There was only a limited communal service of "company doctor" type, using doctors from the care center.

The population of the areas in question is described in Tables I and II.

1) The terms "Commune" and "Council" when referring to the county communal authorities, are used interchangeably in the literature.

Table I. The populations of Malmöhus County, Ystad Medical District and Commune, and Skurup Commune, by age-group and sex, December 31, 1981.

Age	Sex	Malmöhus County	Ystad Medical District	Ystad Commune	Skurup Commune
0-14	Male	53,266	4,969	2,073	1,404
	Female	50,617	4,708	1,909	1,360
	Both sexes	103,883	9,677	3,982	2,764
15-44	Male	110,489	10,339	4,601	2,632
	Female	107,705	9,497	4,334	2,460
	Both sexes	218,194	19,836	8,935	5,092
45-64	Male	53,623	5,792	2,796	1,298
	Female	54,646	5,851	2,909	1,310
	Both sexes	108,269	11,643	5,705	2,608
65-74	Male	21,512	2,798	1,357	592
	Female	25,522	3,109	1,630	643
	Both sexes	47,034	5,907	2,987	1,235
75+	Male	12,998	1,920	870	448
	Female	21,068	2,634	1,343	573
	Both sexes	34,066	4,554	2,213	1,021
Total	Male	251,888	25,818	11,697	6,374
	Female	259,558	25,799	12,125	6,346
	Both sexes	511,446	51,617	23,822	12,720

Table II. The population of Malmöhus County by Commune, December 31, 1981.

Commune	Number	Percent
Bjuv	14,529	2.8
Helsingborg	102,119	20.0
Höganäs	22,186	4.3
Landskrona	36,240	7.1
Svalöv	12,903	2.5
Burlöv	14,476	2.8
Kävlinge	20,702	4.0
Lomma	16,663	3.3
Lund	79,099	15.5
Staffanstorps	16,758	3.3
Eslöv	26,865	5.3
Hörby	12,686	2.5
Höör	11,015	2.2
Svedala	15,750	3.1
Trelleborg	34,267	6.7
Vellinge	23,571	4.6
Sjöbo	15,075	2.9
Skurup	12,720	2.5
Ystad	23,822	4.7
Total, all communes	511,446	100.1

Information systems

In this study the terms "information", "system" and "information system" in health and medical care are used according to the following definitions.

Information:

"... is understood as a representation of reality. It 'stands for' something apart from itself, and exists entirely within a universe of symbols. It represents not only the static fact of the external world but also its operations and activities, and the utility of information both in science and in social planning depends upon the postulate that operations carried out upon elements of information will correspond consistently with real actions carried out upon real objects." (2).

System:

"A set of inter-related elements brought together to achieve a purpose in the environment in which the system exists." (30).

Health information system:

"A mechanism for collection, analysis and distribution of health statistical information required to enable health planners to assess priorities, and to assist them in deciding how to meet particular priority needs and finally to enable health administrators to measure their achievements." (30).

Statistical systems in Malmöhus County Government

The systems for in- and outpatient care in Malmöhus County can be defined as individual-based computer systems for the processing of statistical information about patients and their contacts with the health and medical care services. These systems are described in greater detail in the following sections. The description is based upon various handbooks for the application and use of the systems (31).

By decision of the planning committee for medical care in Skåne, May 1968 (32), the responsible organizations introduced as of January 1, 1969 a system for the registration of operations and diagnosis in connection with each inpatient care episode. This was called the "Patient Registration System in Skåne". On May 1, 1970 another system was introduced, called "Care Planning System in Skåne". During the period 1974 to 76 these systems were replaced by an integrated system called the "Inpatient System for Malmöhus County", which included all inpatient facilities within the county and offered functions for the registration of waiting lists, care episodes, diagnosis, treatment and fiscal data.

The original system included an extended statistical form to be used in delivery wards. This was replaced on March 1, 1973 by a separate system, the "Journal System BB". Information on mothers was transferred annually to the inpatient system's diagnosis and treatment register (search system), while information on babies was only registered upon admission for inpatient care due to illness or malformation.

In 1970 the so-called "7-Crown System" was introduced for outpatient care. In order to alleviate the accounting problem, a computer system was developed in cooperation with Malmö Commune. For Malmöhus County this meant, to begin with, only those visits not paid for in cash but billed. However, since all visits to doctors were registered on the forms, this system could then be expanded into a comprehensive outpatient reporting system. This was implemented during the first half of 1977. The system contained, in part, a register of visits for administrative medical care data on visits and, in part, an accounting register for the collection and reporting of fees. The basic system included 2 auxiliary routines for the registration of waiting lists, diagnosis and treatment.

On January 1, 1976 the reporting form was changed to allow its use for visits to other medical personnel besides physicians. To begin with, such visits were registered only for certain receptions staffed by doctors, but starting in 1981 registration was introduced for visits to all professional categories.

System variables

This study examines only those functions in the system having to do with care episode, visit and diagnosis. Variables that could be purposefully included in this study are shown in Figure 1. Information on the technical characteristics of the system and accounting data are not included.

Variable	Diagnosis register (inpatient)	Visit register (outpatient)	Diagnosis register (outpatient)
Hospital/clinic/reception	X	X	X
Date of admission/discharge/visit	X	X	X
Sex, age, and person-number	X	X	X
Name of patient	X		
Type of admission (from another clinic, hospital or home)	X		
Type of discharge (to another clinic, hospital or home, or deceased)	X		
Type of care (24-hour, day or night)	X		
Emergency or not	X	X	X
Referral visit		X	X
New or return visit		X	X
Previously treated during calendar year	X		
Care episode's sequelae			X
Insurance office	X	X*	X*
Postal code		X	X
Personnel category		X	X
Diagnoses**	X		X
Type of diagnosis (primary or secondary)	X		
External cause	X		X
Death and autopsy	X		
Local, elective codes***	X		X

* If other than Malmöhus main office

** Primary diagnosis is registered first

*** Codes administered by respective care unit for own use

Figure 1. Variables in the registers.

Forms

The following sets of forms were used in the inpatient system.

- Application for care, admission and discharge.
- Admission to and discharge from emergency hospital or psychiatric hospital.
- Transfer to another clinic.
- Leave. This form was rarely used for short-term leave privileges during emergency care.
- Diagnoses, operations etc.

In outpatient care, another set of forms was used in duplicate (at units not registering the diagnosis) or in triplicate (at units where the diagnosis was registered).

Classifications

Unit code was used to identify each care unit as a fiscal entity under the system for accounting and budget planning. Before 1979 another system of codes for inpatient hospitals and clinics was used, following a list provided by the National Board of Health and Welfare.

Insurance office and postal codes are used in this study in order to identify the patient's place of residence. Insurance offices were classified according to the insurance system's codes for local offices. The entire county area came under one main office for Malmöhus County. All local branches were identified by a 4-digit code with "12" as the first 2 digits. These digits were unique for the county area, so that patients from this area could be identified. The codes for local offices were identical with official commune codes, with the exceptions of Vellinge and Svalöv communes (33). Since 1981 there has been more than one local branch in Helsingborg and Lund. During the 1970's a number of changes were made in the classifications and in area boundaries. For the purposes of this study, the most important restriction was that Staffanstorps Commune could not be distinguished from Lund until the late 1970's.

Postal code was recorded as a 5-digit number. Postal codes in the range 222 02 to 275 00 occur in Malmöhus County, Malmö Commune, and Kristianstad County (34).

Insurance branch offices and postal codes for Malmöhus County are shown in Figure 2.

Commune Code	Name	Insurance office	Postal codes (beginning with)
1214	Svalöv	1208	2602, 268
1230	Staffanstorp	1230	245
1231	Burlöv	1231	232
1233	Vellinge	1288	2301, 235
1260	Bjuv	1260	2605, 267
1261	Kävlinge	1261	2402, 244
1262	Lomma	1262	2305, 234
1263	Svedala	1263	233
1264	Skurup	1264	2701, 274
1265	Sjöbo	1265	2703, 275
1266	Hörby	1266	2405, 242
1267	Höör	1267	2404, 243
1280	Malmö	3400-3408	20, 21, 2303*, 2304**
1281	Lund	1226, 1227, 1281	22***, 2401
1282	Landskrona	1282	2601, 261
1283	Helsingborg	1283, 1289	25, 2603
1284	Höganäs	1284	2604, 263
1285	Eslöv	1285	2403, 241
1286	Ystad	1286	2702, 271
1287	Trelleborg	1287	2302, 231

* Postal code 230 32 refers to commune 1263, Svedala.

** Postal codes 230 40 and 230 41 refer to commune 1263, Svedala, while code 230 47 refers to commune 1231, Burlöv.

*** Postal code 220 12 refers to commune 1230, Staffanstorp.

Figure 2. Insurance offices and postal codes in Malmöhus County.

Diagnoses were classified according to the ICD (eighth ed.), 5-digit system. (35). For outpatients, however, the coding system has not been regulated but space is available for 5 digits. Whenever 3- or 4-digit codes were used (36), these have been completed with zeroes to fill out all 5 positions.

Data processing routines

The term "data processing" has been defined as "a general term for all operations such as editing, coding and tabulation carried out on data according to precise rules of procedure. (It is) frequently used in a more restricted sense to refer to the use of electronic computer equipment for such operations." (30).

In PAS-SV (Patient Administrative System, Inpatient Care), data have been registered successively during the care episode, reflecting placement on a waiting list, admission, transfer to another clinic, long-term leave, discharge, and assignment of diagnosis. Each form was entered into the system at the respective patient-administration office. Forms for a given patient were collated for computer processing with the help of a reference number.

In the outpatient-visit register, forms were completed before the visit by the office in question. The original was processed by computer, while the copy became the patient's receipt. The forms were sent daily from the various hospital receptions to the patient-administration office and from there they were forwarded weekly to the county government's accounting office, after checking and comparison with the daily office ledgers. Forms from the district doctors' receptions were sent in daily, directly to the accounting office. The forms were then sent to IBM Corp. in Malmö, where they were registered by means of an optical reader, then forwarded as magnetic tape records to Kommundata AB, a public corporation with headquarters in Stockholm and regional offices in Lund. The computer system (SAAB-UNIVAC) produced a check-list for adjustments, after which corrections were registered by Kommundata personnel. The computer records were checked each month against the accounting reports. The register was updated on a quarterly basis and accumulated for the year. Due to the large number of visits, the register was divided up by medical district.

In the outpatient-diagnosis register the third copy of the outpatient form was placed in the patient's journal to be filled in later by a medical secretary, after assignment of diagnoses and possible operation code by the physician. The form was designed for optical reading but in spite of this the data were registered by key-board entry. These data could then be associated with visit data by means of the pre-printed reference number. This register was updated each month and accumulated by year.

Information was retrieved from the diagnosis register (inpatient) with the help of search routines. It was possible to request current statistics during the year, since data were registered successively throughout the year. Annual data became available about 4 to 5 months into the following year. Statistical data not exceeding one calendar year could be summarized into a single table. Data crossing a year boundary could be obtained, temporarily covering the first few months into the new year.

Care episode was the primary unit of information in the search routine. Transfer from one clinic to another was treated as a second care episode.

The entire registered material could be processed together, which made it possible to calculate waiting times, number of care days, number of days of leave, number of long-term-leave days, night-care days, daytime-care days, postoperative hospitalization time and days of preoperative care.

The search routines also included facilities for the retrieval of information from the outpatient register.

Utilization of the statistical systems

No detailed statistics are prepared on the extraction of information from the systems. Certain information is extracted regularly and other information as needed. A basis for the description of how the systems are used was obtained by interview of the persons responsible for the systems. The description of their utilization in the planning processes for health and medical care in Malmöhus County is, however, based upon the personal experience of the author.

Information was retrieved from the diagnosis register (inpatient) per calendar year using standard routines. Various user-specific reports were also available through standard routines. Such requests were used primarily for production, planning, production control, and research. The number of requests has increased during recent years. The outpatient registers were used for monthly follow-up of production, for planning, and to some extent for research.

In connection with health and medical care planning, the systems were mainly used in studies of consumption of services and patient flow (13). They were used only to a limited extent for description and analysis of occurrence of illness.

In this chapter methods are described for the analysis and evaluation of statistical systems used in the study. The chapter begins with a discussion about various possible approaches to the evaluation of systems. Methods are then suggested for the qualitative evaluation of data and systems. Finally, statistical methods are described.

Perspective

Systems analysis has been defined as "... the examination of various elements of a system with a view to ascertaining whether the proposed solution to a problem or problems will fit into the system and, in turn, to effect an overall improvement in the system." (30).

Theoretical/analytical approach

Information about the state of health of the population and its relation to the environment theoretically requires all of the following measures:

- registration of all disturbances in state of health at individual level
- registration of individual characteristics and exposure to factors in the environment, which can affect the health of the individual
- methods for the storage and processing of information over long periods of time, in principle throughout the life span of the individual.

It is obviously difficult to meet these demands in practice. It is difficult, for example, to define and measure "lesser" disturbances in the state of health, or to be confident as to which factors in the environment, or combinations thereof, can affect health. It is difficult to collect and maintain large masses of data on a current basis and to keep all factors under control during processing. In many situations there is an appreciable delay between exposure and onset of illness, which further complicates the search for relationship. There are also ethical questions in connection with the collection and storage of comprehensive information about the individual.

Limits must always be placed on an information system. In the statistical systems now being used in Malmöhus County, there are limitations affecting all three of the areas mentioned above:

- only those illnesses leading to contact with the medical care service are registered
- only a few individual characteristics and environmental factors are registered
- processing of records at individual level is limited.

Such a theoretical evaluation of the statistical systems in Malmöhus County lies outside the scope of this study. In the concluding discussion, however, some viewpoints are expressed as to possible supplementation from other registers.

A social approach

The statistical systems can also be evaluated from a social viewpoint in various ways: for example, by interviewing representatives from affected groups, such as politicians, administrators and patients, regarding their views on the usability of the systems.

Systems can also be evaluated by studying how they are used, what feedback occurs from users to system managers, and what significance the systems have in the decision making process, affecting organization and resources for health and medical care. Since the statistical systems are directly intended as components in the accounting routines and as a basis for production follow-up, their success in meeting these objectives can also be regarded as an appropriate subject for evaluation.

However, the statistical systems are not evaluated in this respect in the present study, since that kind of evaluation is being carried out elsewhere in connection with the development of systems for production follow-up in Malmöhus County.

Empirical approach

Another possible approach to the evaluation of statistical systems is to use them. An empirical study of this kind can include both a qualitative evaluation of the material and a testing of the various possibilities for processing. The present study is primarily an empirical evaluation, according to these criteria.

Quality of the data

In the PAS systems for in- and outpatient data, the following checks were included:

- coordination of various forms resulting from individual contacts with the medical care services
- occurrence of illegal codes
- occurrence of improbable data, such as discharge date ahead of admission date.

In the PAS system for inpatient data there were also routines for the completion of missing data. Incomplete person-number was not changed, however.

Variables relating to the individual, population group and illness were central to the study. Reliability of registration was investigated by measuring the number of incomplete and illegal entries for these variables.

The patient's person-number was defined as incomplete when any of the last 3 digits (excluding the check-digit) were missing. In regard to PAS for inpatient data, determination was made as to how frequently the person-number was incomplete for patients with breast cancer, acute myocardial infarction and diabetes mellitus, during the period 1977-1979. Patients accepted under contract from outside the county were included. Errors in person-number were investigated by comparing data for breast-cancer patients from Malmöhus County with the regional tumor register (RTR).

The proportion of incomplete person-numbers in PAS for outpatient data was checked routinely. In this case, person-numbers were classified as incomplete when any one or more of the 10 digits were missing. Comparable data on incorrect person-numbers for outpatients were not available and were therefore not checked.

Sex was entered as code 1 for male patients and code 2 for females. In PAS (inpatient) there is a programmed check on consistency between this code and the ninth digit of the person-number, which is always an odd number for men and an even number for women. The results of this check were studied for women with diagnosis of breast cancer. In PAS (outpatient) there is a corresponding routine. In this study the relationship between sex code and ninth digit of person-number was investigated using a 10- percent sample of all visits for men during the first quarter of 1980 at the medical care center in Skurup or at the hospitals in Lund and Ystad for patients coming from Skurup Commune.

Age of patient was calculated from date of birth to date of admission, discharge or visit, for the purpose of presentation in tables. When reporting individual care episodes or visits, age was calculated as that age attained by the patient during the current calendar year regardless of whether the contact occurred before or after the patient's birthday.

Routines were not available for checking birthdate. However, certain errors of this type could be identified, if the person-number was complete, by verification of the tenth (check) digit. In PAS (inpatient) data on age were investigated by comparison with the RTR for patients with breast-cancer.

Data on place of residence were deduced from the insurance-office code (inpatients) or the postal code (outpatients). The proportion of unidentified insurance-office codes was investigated by tabulating, for patients from Malmöhus County, the number with missing code and the number with accepted codes respectively. It was then possible, by comparison, to determine the proportion having an incorrect code. For women with breast cancer, comparison was made between registered insurance-office code and data on county and commune obtained from the RTR.

In those cases where postal code crossed a commune boundary, the code was referred to the commune having the greater number of households. The

results of this classification were compared with the actual number of households in the commune.

Agreement between diagnosis and illness according to PAS (inpatient) was investigated by comparison with the RTR, for patients with breast cancer. During 1973 and 1974 a consistent error occurred when pharmaceutical drugs were incorrectly registered as diagnosis code.

Quality of the system

The quality of the system was investigated partly in terms of loss of data and partly in terms of how the results of processing agreed with data in other registers.

Missing records could be investigated because data in the PAS (inpatient) are registered sequentially. When the diagnosis register is created, about 4 to 5 months into the new year, not all records have yet been processed. Later entries are subsequently added to the register. Certain records, however, remain incomplete. For the years 1974-1976 such records were removed from the diagnosis register, which made it possible to determine the number for these years. For 1975 one register was missing from PAS (inpatient). The number of records that should have been in this register could be calculated on the basis of annual narrative reports. For PAS (outpatient), material for the period 1977-1979 was compared with manually prepared statistics.

Missing data on age were specially tabulated.

If information on sex was missing from PAS (inpatient), the record was rejected and the necessary information obtained to complete the record. In PAS (outpatient) the loss of data was investigated for visits to the emergency reception at the hospital in Lund.

Loss of data on place of residence was also investigated by special tabulations.

In PAS (inpatient), records were routinely checked for the presence of information on diagnoses. In PAS (outpatient) there was no such check.

Results of processing could be compared with the RTR, which contains all persons living in the southern medical care region with diagnosis of malignant neoplastic disease. In the present study material was processed from PAS (inpatient) for patients with breast cancer. It was therefore possible to compare the material from the two systems.

Lists were generated from the RTR for patients from Malmöhus County, registered as having malignant neoplasms of the breast during the period 1970-1977. Included in the lists was information on person-number, parish, hospital, clinic, diagnosis, and date of death, along with certain medical data. Bilateral breast cancers were registered as 2 separate illnesses.

When the primary material was retrieved, the RTR was current up to and including the year 1977. The data bank included, however, a number of

cases with onset prior to 1970 or after 1977. This information was used in checking on patients not represented in the RTR during the period 1970-1977.

Information on patients represented in the one register for 1975-1977 were compared with all available information in the other system and vice versa.

For patients whose records could not be matched, further information on name was obtained from the hospital's patient-administration office. If not available from that source, the patient's journal was then requisitioned and studied.

In cases of incomplete person-number, the patient was regarded as found in the RTR if birthdate and commune code were in agreement. Age was calculated from year of birth in both materials.

On verification, it was found that the linkage of care episodes was incorrect in a number of cases where complete person-number was not available. One illustrative example can be taken from a patient who was registered in 1970 with incomplete person-number in one commune and again in 1975 with complete person-number in another commune. These care episodes were not linked. Comparison with the RTR showed that these care episodes related to the same patient. Other examples showed associations between care episodes that had been incorrectly attributed to one patient although two patients were actually involved.

Errors and losses could be counted by cross-checking. Losses also included bilateral cancers, since information on primary site was missing from the PAS registers.

Statistical methods

Standardization

Comparability between two sets of material can be increased with the help of standardization. Data in this study have been standardized according to the age and sex distributions for the various populations. Other methods are also available, such as allowing the standard population to be made up of the two populations combined (37).

Still another method is to compare the observed number of cases with an "expected" number. Observed and expected frequencies are accumulated by age and sex, for example, and the ratio calculated. This method can be used when the age- and sex-specific figures are too uncertain, which was often the case in the present study, since the occurrence of illness was studied at commune level. A similar model has been used in other studies (20).

Tests of significance

In statistical analysis it is not enough that relationships be significant; they must also be interesting (38). Significance tests used in this study are not

intended to replace critical thinking, but have been used as an aid in the identification of interesting differences. They may support the motivation of more detailed studies, which are facilitated by the fact that individual-related data are accessible and may be used, for example, in studies of the medical records.

This implies that so-called mass significance is not an essential factor in this study. Each test is regarded as being based upon a hypothesis that is specific for that test, regardless of other possible hypotheses in the same or other materials. The problem of mass significance has been discussed in various studies (39, 40).

This also means that the power of the probability values presented in the study must be judged individually. For comparisons by commune, those communes are shown where p-values differed markedly from those for other communes. In order to facilitate interpretation of results, the lowest p-value observed among remaining communes was also shown. This was called the p-value boundary.

Calculator

Statistical tests were not included in the search routines. As a number of statistical tests were used in the study, many calculations were carried out on a programmable calculator of sufficient complexity that it might well be called a "personal computer". Tests on regional illness patterns can be mentioned as one example of computations that were greatly simplified by the calculator.

Programs and data were stored on magnetic cards. Using the program cards, expected frequencies of illness were calculated for every commune by age, sex, and year. Total expected values were then summarized for each commune. Data cards, with information about the populations of the communes by age, sex, and year, were used as input to the calculations of expected values.

The expected value for the commune was then tested against its observed value and a probability of agreement was calculated. For each test, it was only necessary to provide the calculator with data on observed occurrence of illness, total per commune and distributed by sex, age-group, and year for the entire Malmöhus County.

The calculator has subsequently been improved by substituting magnetic tape cassettes (mass memory) for magnetic cards, thereby making it possible to store a larger mass of data and to shorten processing times.

In the statistical systems, care episode and visit were the primary reference points. Consumption of services could be measured by relating the material to specific subpopulations, such as age, sex, and geographically defined groups. The number of contacts per resident could be compared in various ways: for example, between time periods or between various population groups. The material could also be broken down into individual illness categories.

Care must be taken to distinguish between demand for services and actual consumption. If the processing of data on consumption is to yield, indirectly, a fair representation of how demands for service vary in time or between groups, it must then be shown that variations in accessibility to care or in treatment procedures are not affecting those variables that we hope to use as measures of consumption. Provided that any analysis of consumption is combined with analyses of availability and treatment procedures, it is possible to obtain a valid impression of demand for services as well as of the degree of illness manifested in contacts with medical care service. It is also possible to analyze occurrence of illnesses that always (or nearly so) lead to contacts of the kind that are routinely registered in the statistical systems.

In brief, the material in this study was processed in relation to specific population groups, whose various contacts with medical care units were the primary points of reference. Age was defined as the exact age of the patient at time of contact.

Selection of material

There was good access during the 1970's to material from the statistical system covering the inpatient sector, for purposes of health and medical care planning. This kind of material is now maintained by the majority of organizations delivering medical care in Sweden, and is also thoroughly exploited by various central agencies.

Since this system was already in use in Malmöhus County by 1969, it was decided that the present study should include an examination of trends in the number of care episodes for various diagnoses during the 1970's, thereby indicating possible changes in the pattern of care for different diseases.

For outpatient care, no comprehensive system for reporting of diagnosis has been previously available. Preparations for this study therefore included a strenuous effort toward complete registration of diagnosis at a majority of care-delivery units serving a definite population. The number of such units within the Ystad Medical District was small and at the same time accounted for a high proportion of that population's medical visits. This was therefore a suitable district, in which to introduce complete registration of diagnosis at all care units. This was done during 1980 and the beginning of 1981 at all units, with the exceptions of the emergency center in Ystad and the medical reception in Lövestad.

Comparable descriptions of diagnosis patterns in outpatient care for defined populations are unusual. The present study has therefore been largely restricted to simple summaries of the numbers of visits per inhabitant for various diagnosis groups and for the most frequently occurring individual diagnoses.

Diagnoses in inpatient care

Data on care episodes in somatic short-term care were processed for the period 1970-1979. The objective was to identify the most frequent diagnoses and to describe any trends during this interval.

The material was made up of patients with residence in Malmöhus County who were admitted for care at any hospital in either Malmöhus or Kristianstad County. Malmöhus County residents who received care in Malmö Commune were studied for the years 1970 and 1979.

For each year information was developed on care episode, age, insurance office, and primary diagnosis. Care episode was defined as the period between hospital admission and discharge. Transfer to another clinic was registered as a separate episode. Age was calculated as of time of discharge. Correction was made for changes in the boundaries of insurance office areas during the period.

Diagnoses were processed using the 3-digit code, except for the groupings shown below, which were only presented in summary.

008-009	Enteritis due to other specified organism and diarrhoeal disease
381-383	Otitis media and mastoiditis
400-404	Hypertensive disease
411,413-414	Other acute and subacute forms of ischaemic heart disease, angina pectoris, and asymptomatic ischaemic heart disease
430-438	Cerebrovascular disease
440-445	Arteriosclerosis, aneurysm, other peripheral vascular disease, arterial embolism and thrombosis, and gangrene
450-453	Pulmonary embolism and infarction, phlebitis and thrombophlebitis, portal vein thrombosis, and other venous embolism and thrombosis
460-474	Acute respiratory infections and influenza
480-486	Pneumonia
490-492	Bronchitis and emphysema
501-519	Other diseases of upper respiratory tract and of respiratory system (excludes hypertrophy of tonsils and adenoids)

531-535	Ulcer of stomach, ulcer of duodenum, peptic ulcer, gastrojejunal ulcer, and gastritis and duodenitis
540-543	Appendicitis
550-553	Hernia of abdominal cavity
580-584	Nephritis and nephrosis
590,591, 593,595-599	Other diseases of urinary system (excludes calculus of kidney and ureter and calculus of other parts of urinary system)
592,594	Calculus of kidney and ureter and calculus of other parts of urinary system
612-614	Salpingitis and oophoritis
640-641	Abortion induced for medical and for other legal indications
740-759	Congenital anomalies
760-779	Certain causes of perinatal morbidity and mortality
Y00-Y79	Supplementary classification.

Acute myocardial infarction (410), chronic ischemic heart disease (412) and cerebrovascular disease (430-438) were further classified as with or without hypertension. Delivery-related diagnoses (650-662) were excluded from the material.

Processing included those diagnoses or diagnosis groups which, for any year, constituted at least 1.5 percent of all care episodes for Malmöhus County residents treated within the county. A corresponding selection was made for each age group. As a result, diagnosis categories which increased or decreased during the period were included, even though their proportion reached 1.5 percent for only 1 year.

Data lost due to missing registers for 1975 constituted 1.9 percent of all care episodes for that year, or 0.2 percent for the entire 10-year period. Data lost for patients treated in Malmö was 1.3 percent of all care episodes in 1970 and 1.6 percent in 1979. Data loss was evenly distributed among age groups and various diagnoses, with the exception of congenital malformations, for which the proportion of care episodes occurring in Malmö was 4.6 percent in 1970 and 12.6 percent in 1979.

Episode rates per 100,000 residents were calculated for each group as observed on December 31 of each year. Mean values, regression coefficients and coefficients of correlation were calculated for the 10-year period. The regression coefficient b , obtained from the regression line $y = a + bx$, where y is the number of care episodes and x the calendar-year, discloses the average annual positive or negative change in numbers of care

episodes. The coefficient of correlation is one measure of the degree of relationship between numbers of episodes and calendar-year. Significance was evaluated by means of the t-test. Numbers of observed and expected care episodes in various communes were compared for the following diagnoses: malignant neoplasms of the breast (women), diabetes mellitus, and acute myocardial infarction. This material was available for the period 1975-1979 and was therefore comparable with other materials in the study.

Diagnoses in outpatient care

Outpatient visits to units within the Ystad Medical District were processed for the period from April 1st to December 31st, 1981, and covered visits to physicians at all medical facilities within the district except for the emergency unit in Ystad and the medical reception in Lövestad.

The material was processed for primary diagnoses at the 3-digit level. It is reported for the different chapters in the WHO classification, and by age and sex. The most commonly occurring, specific diagnoses are also reported by age. The criterion for selection was that the diagnosis should represent at least 1.5 percent of all visits (excluding checkup visits) in the given age group. The data are related to population as of December 31st, 1980.

Visits to units other than those included in the study constituted an estimated 24.5 percent of all visits by the population of the district. Furthermore, age data were missing for 0.5 percent of visits. The material therefore comprises 75 percent of all visits. About 4 percent of visits to facilities within the district during 1979 were made by residents from other districts. This proportion can be expected to hold, approximately, for 1981 as well. Such visits are included in the present material, and if the assumption is made that their distribution by age, sex, and diagnosis is not significantly different from that of residents within the district, then the present material may be taken as representative of about 80 percent of all visits made by district residents.

Consumption of services in inpatient care

Numbers of care episodes in inpatient care were counted for the most frequently occurring diagnoses during 1970 to 1979, using methods already described under "Diagnoses in inpatient care". The material was supplemented with "other diagnoses" in order to obtain a total picture of care consumption, excluding delivery. Trends during the period were studied using regression analysis.

The distribution of care episodes at various units and for the populations of different districts was studied for the period 1969 to 1978. All care episodes except deliveries were studied by commune of residence and hospital.

Consumption of services in outpatient care

Numbers of visits to physicians per inhabitant, sex, age, and type of facility within Malmöhus County were studied for 1979. Visits by patients from outside the county were excluded on the basis of their postal code identification. Missing data were evaluated by comparison with annual reports. Data on age and/or sex could not be obtained in 1 percent of cases. In the case of pediatric receptions, it was assumed that visits had been made by children under 15 years of age. At psychiatric units some entire records were missing, which accounted for 11 percent of all visits at such units. Visits to child-psychiatric units in Lund and Landskrona were not registered.

Visits to hospital emergency and nonhospital specialist units were counted as hospital care, while visits to nonhospital emergency units were counted as primary care. Visits to laboratories, x-ray, anesthesia, physiotherapy, counseling service, industrial care, specialized screening units, deliveries, dialysis, isotopic examinations, rehabilitation day-care, anti-smoking, and psychiatric day care were not processed.

When analyzing the material by commune of residence and care unit, no tabulation was carried out by age and sex. Data lost in that analysis amounted to about 2 percent, but after adjustment on the basis of other statistics, the materials were largely in agreement. Numbers of visits were also adjusted for disagreements between postal code and commune boundary, as shown in Table V.

Insurance offices provided information on visits to private practitioners. The material included visits to doctors associated with the public health insurance system who were practicing within the county. Only total numbers of visits were available from this source; data on age, sex, and residence commune were missing. Furthermore, information was lacking on visits by Malmöhus County residents to private practitioners outside the county: primarily in Malmö.

One way of analyzing the consumption of medical care and illness patterns is to make use of individual-based data, thereby avoiding in many cases those sources of error which depend upon differences in treatment procedures. It becomes possible to verify the extent to which patients under otherwise similar circumstances may experience differences in regard to visits and care episodes.

The present study makes use of material related to defined population groups, where every individual's accumulated contacts with the health service for treatment of a given illness constituted the focal point of interest. This was accomplished with the help of computer "print-outs", processed manually, in the absence of programs for the linking of data from different contacts. Due to the method of registration, lists were necessarily prepared by calendar year. For outpatients the material was stored separately for the various care units within each district, so that total contacts per district could only be obtained by collating the material from multiple lists.

Age of patient was calculated from year of birth, regardless of whether the contact occurred before or after the patient's birthday. In some cases, exact age was calculated manually.

Selection of material

Individual-related material was used to describe, in part, the characteristics of outpatient visits for defined populations and, in part, the occurrence of various illnesses. Because total inpatient care episodes by population group, based upon individual-related material, have previously been the subject of a study in the Uppsala region (41), no such analysis has been carried out on the present material.

This study includes diseases which require and illustrate various methods of statistical and data processing. They are also of interest to the county government in meeting its increased responsibility for the health of the population. In Malmöhus County programs are already under way or being planned, with a view to the earlier discovery and improved treatment outside hospital of patients suffering from diabetes, asthma, and rheumatoid arthritis.

The health services can also contribute toward the prevention of motor-vehicle accidents. Another program is planned for the early diagnosis of breast cancer. Otitis media is a common ailment among children, with some children suffering frequent infections; for which reason it can be important to identify groups at risk and initiate preventive measures. The same applies to acute myocardial infarction.

Each of the above named diseases is of common occurrence, either among the population at large or among specific groups according to age or sex. For each respective ailment, either incidence (the number of new cases arising during a given time period) or prevalence (the number of existing cases at a given point in time) was calculated.

Visits per individual

Material

The following method was used to study the visit patterns of individuals. Information was obtained for 1979 from computer lists of all visits to physicians for somatic, outpatient care among residents of Skurup Commune, regardless of whether such outpatient care was received at the medical center in Skurup or at hospitals in Ystad or Lund. Visits to non-hospital units in Ystad were also included. The material was sorted by sex and date of birth and contained information on sex, person-number, age, postal code, care unit, planned or emergency visit, new or return visit, referral, and date of visit.

The lists were processed manually. Visits for each individual were identified, so that data from combinations of visits to the various units could be linked. In the absence of complete person-number, visits were attributed to one individual if date of birth, sex, and postal code were in agreement.

Visits to laboratories and x-ray units as well as visits to private physicians or company doctors were not included in the material.

Sources of error

Postal codes covering Skurup Commune include approximately 10 percent more households than those properly attributable to the Commune itself (Table V). In attempting to relate numbers of visits to the underlying population, there was therefore about a 10 percent over-representation of patients. On the other hand, distributions of visits according to care unit, age and sex, and per individual, should remain relatively unaffected.

Malignant neoplasm of breast

Incidence and prevalence

An attempt was made to determine the incidence of breast cancer (ICD 174) by means of analyzing data on discharges following inpatient care. Information was obtained from computer lists, covering the period 1970-1979, for all discharges after treatment at any somatic, inpatient clinic in Malmöhus County, for women over 15 years of age with primary or secondary diagnosis of breast cancer. The material was sorted by date of birth and contained information about person-number, age, diagnosis (5-digit level), type of diagnosis, insurance office, hospital, clinic, date of admission, date of discharge, days of care, planned or emergency admission, type of admission, and type of discharge.

The lists for the entire period were processed manually. Care episodes for patients living outside the county were excluded. Episodes were then linked for each individual. Incidence was calculated for each 5-year age group in the range 30-84 years, and for the two limiting age groups, 0-29 years and 85 years or older. Age was calculated from year of birth to year of first registered episode.

For many patients the period of illness lasted several years. Since 1970 was the first year included in the material, incidence could not be calculated for the first few years of the period. Patients with onset prior to 1970 would tend to exaggerate incidence during the first years of the study. After analyzing the material for evidence as to how often patients returned for continued treatment over several years, it was decided that reliable incidence figures could be calculated for the period 1975-1979.

Similarly, prevalence could be calculated for only a part of the study period. To patients receiving care during a given year, were added those who had received care both before and after that year. Prevalence was therefore calculated only for the year 1975; prevalence estimates for the years 1976-1979 were based upon incidence (42). Average duration of illness was calculated for new cases during 1975 by determining how many of these reappeared as inpatients during 1976-1979.

Patients first registered during the period 1975-1979 were enumerated according to residence commune. At the same time, expected values were calculated for each year and commune on the basis of total frequencies for the population of Malmöhus County but taking into account the individual age distributions of the separate communes.

Variations between communes were evaluated by means of the chi-square test applied to material for the 5-year period in the age groups 15-44, 45-64, 65-74, and 75 years or older.

Errors and loss of data

This material was compared with information contained in the regional tumor register. Methods and the results of the comparison are presented in the chapter on quality of the systems. Only material from PAS (inpatient) is presented here.

In the absence of person-number, care episodes were regarded as relating to the same patient if date of birth and insurance office code were in agreement. The magnitude of erroneous linkages of records could be evaluated on the basis of the proportion of incomplete person-numbers and the incidence of the disease.

The proportion of care episodes for county residents with incomplete person-number was 32.5 percent. This proportion was highest during the earliest part of the period (39 percent for 1970-1972 compared with only 5 percent for 1977-1979).

For women over 30 years of age in Sweden, 1978, the incidence of breast cancer has been found to be 167 per 100,000 women (43). At the same time, the number of women in this age group for any one commune on December 31, 1979 was at most 34,050 (Helsingborg Commune). The probability of an incorrect linking of records for two patients with the same date of birth and incomplete person-number was therefore quite small. In fact, when person-number is incomplete, there is probably a slightly greater risk of failing to associate the records of a patient, with multiple care episodes, who has changed residence from one commune to another. Incidence figures are therefore slightly exaggerated but the error can be disregarded.

Patients who were resident within the county but were treated for their disease exclusively under some other jurisdiction were excluded from this study, as were patients already under long-term, in-patient care who were not admitted to any emergency clinic. If, during the course of this disease, a patient received concurrent treatment at an outpatient facility, this information was also missing.

Diabetes mellitus

Regional differences

An attempt was made to determine the regional differences for diabetes mellitus (ICD 250), by analyzing discharge data for inpatients.

Computer print-outs by calendar year, for the period 1970-1979, provided information on all inpatient discharges from all somatic care units in Malmöhus County, where diabetes mellitus was registered as either primary or secondary diagnosis. The material was sorted by sex and date of birth. It included information on sex, person-number, age, diagnosis (5-digit level), type of diagnosis, insurance office, hospital and clinic, date of admission, date of discharge, days of care, planned or emergency admission, type of admission, and type of discharge.

The lists for the period 1975-1979 were processed manually. Care episodes for nonresident patients were first deleted. Episodes were then linked for each patient.

Patients were enumerated according to commune of residence. Expected values were calculated by year, taking into account the age and sex distribution of each commune in relation to frequencies obtained for the entire county population. Comparisons were made (and evaluated using the chi-square test) for the entire 5-year period in the age groups 0-14, 15-44, 45-64, 65-74, and 75 years or older. Age was calculated from year of birth to first registered care episode.

For patients who had received care both within and outside the county, only within-county information was used. If the patient had moved within the county, place of residence was assigned as shown for the first registered episode.

Sources of error

The complete person-number was available in most cases; even when not complete, the date-of-birth portion was always included. Care episodes for patients with the same date of birth and sex were regarded as the same if insurance-office code also agreed. The proportion of incorrect linkages can be estimated from the yearly proportions having incomplete person-number, which were 36, 18, 7, 6, and 5 percent for the years 1975-1979, respectively. Since only a few persons within any given commune were born on the same date, while the proportion with incomplete person-number was small, there were few incorrect linkages of records.

Diabetes patients who moved into Malmöhus County during the period were included. Because residence changes across county boundaries were rare among patients in the upper age groups, where diabetes was most frequent, this potential source of error was not regarded as significant. For example, during 1979 only 665 persons over 65 years of age moved into the county (44); this constituted less than 1 percent of the county population in that age group.

The diabetes population is made up predominantly of persons in the upper age groups. The number of deaths during a 5-year period is therefore appreciable. The material was not adjusted for this, due to the prohibitive amount of manual effort that would have been required. For the less extensive material of Ystad Commune, however, this adjustment was carried out.

Only inpatient material was included. Differences between communes might therefore be affected by differences in procedure among the various hospitals. If frequencies of admission for all causes were found to vary, this might well affect the number of diabetics appearing in the material. In order to test whether or not this might be the case, coefficients of correlation were calculated for number of diabetics per 100 inhabitants in different communes and number of care episodes per inhabitant.

Another hypothesis to be tested was that possible variations in criteria for the admission of diabetic patients would be reflected in the observed numbers of diabetics in the material. To test this hypothesis, correlation coefficients were calculated between numbers of diabetics per 100 inhabitants in different communes and numbers of care episodes per 100 inhabitants, with diabetes mellitus as primary diagnosis.

All values were for the period 1975-1979 and were standardized for age in relation to the age distribution of the population of Malmöhus County on December 31, 1977. The significance of correlation coefficients was tested using the t-test.

Prevalence

A more thorough analysis was carried out for Ystad commune. Here the material was supplemented with information from Ystad Hospital, for the years 1980 and 1981, regarding inpatient discharges with a diagnosis of diabetes mellitus. For 1981, information was also obtained on all outpatient visits in Ystad, both hospital and non-hospital, with a diagnosis of diabetes mellitus. This included visits to physicians as well as to other categories of health-service personnel. The lists included data on sex, person-number, diagnosis (5-digit level), postal code, care unit, date of visit, planned or emergency visit, and new or follow-up visit.

All lists were processed manually and data for individuals were linked. The material was checked against the current population register of January 27, 1982 for all patients who had received care during 1975-1980 (but not 1981) and also for patients 75 years of age or older. Doubtful postal codes were also checked. Name was obtained for patients with incomplete person-number in the PAS (inpatient); this information was not available

from the PAS (outpatient). Patients with incomplete person-number were included in the material if date of birth and sex agreed with information for some person in the commune. Age was calculated as exact age on December 31, 1981.

Otitis media without mention of mastoiditis

Incidence

The attempt was made to determine the incidence of otitis media (ICD 381) using data on outpatient visits. Visits within Ystad Medical District, with otitis media as primary diagnosis, were identified from data lists for the period April 1, 1981 to March 31, 1982. The material was arranged by sex and date of birth and contained information on sex, person-number, age, postal code, care unit, primary diagnosis (5-digit level), new or return visit, and date of visit.

The lists were processed manually. Visits by nonresident patients were excluded. New visits were enumerated as new cases of the disease, while follow-up visits were linked with previous visits as applicable. Incidence was calculated for ages under 1 year, 1, 2, 3, 4, 5-9, 10-14, and 15-19 years as well as for both sexes. Age was defined as exact age at time of first visit for the given episode. Data for patients over 19 years of age are presented in summary, only.

Sources of error

Complete person-number was not available for 6.2 percent of all visits. These were associated with other visits if date of birth, sex, and postal code agreed. Such linkages accounted for 1.7 percent of all visits. Since only a few persons were born on the same day, the number of incorrectly linked records was probably quite small.

Loss of data

Diagnosis was not available for visits to the emergency center in Ystad or the reception in Lövestad. For such visits, however, there was a high probability of the patient's subsequent appearance at some other unit as a follow-up visitor, leading to inclusion in the incidence calculations. Such visits could still lead to an under estimation if a patient had already had another episode of otitis media, since the follow-up visit would then be incorrectly associated with the previously registered visit.

Some check-up visits may have been registered under Y-diagnoses. This does not affect the incidence calculations, however.

Visits in other medical districts were not included. In 1979, visits within the district of residence accounted for 85 percent of all visits for all causes. The percentage for otitis media, in particular, is not known.

Acute myocardial infarction

Incidence

The attempt was made to determine the incidence of acute myocardial infarction (ICD 410) using data on inpatient discharges. Computer lists for each year during the period 1970-1979 provided information on all discharges for inpatients over 15 years of age with primary or secondary diagnosis of acute myocardial infarction at all somatic care clinics in Malmöhus County. The material was arranged according to sex and date of birth. The lists contained data on sex, person-number, age, diagnosis (5-digit level), type of diagnosis, insurance-office code, hospital, clinic, dates of admission and discharge, days of care, planned or emergency admission, type of admission, and type of discharge.

Lists for the period 1975-1979 were processed manually. Care episodes for patients living outside the county were first excluded. Thereafter, care episodes were linked for individual patients by the following procedure: admission to a clinic on the same day, or the first day following discharge from another clinic, was regarded as a continuation of the same episode, along with those on the second day after a discharge specifically registered as a transfer to another clinic. Care episodes were defined in this way.

Calculation of incidence requires that onset of a new illness episode be clearly distinguished from the continuation of a previously established episode. In order to study the percentage of patients who received care for more than one year, numbers of care episodes were established per patient and year. Calculations were carried out only for males and the results are summarized in Table III.

Table III. Distribution (percent) by year of first registration for reports of acute myocardial infarction during 1976-1979, for male residents of Malmöhus County.

Year of first registration	Reports of acute myocardial infarction during			
	1976	1977	1978	1979
1975	8	4	5	2
1976	92	9	4	4
1977		87	6	4
1978			85	7
1979				83
Total	100	100	100	100

More than 7 percent of patients registered during a given year had been previously treated during the preceding year. Care episodes during two consecutive years were therefore linked together.

It was further decided that all reports during consecutive years should be linked together until interrupted by at least one report-free calendar year. Any new report following one or more report-free calendar years was considered as a new illness episode. Incidence could therefore be calculated for 1976 and later years.

Incidence was calculated as an average per year for the entire 4-year period. In order to study possible trends during the period, the age-adjusted incidence was calculated according to the age profile of the population in 1976, using 5-year age groups from 30 to 84 years, and the terminal groups 0-29 years and 85 years and over. It was assumed that acute myocardial infarction did not occur before the age of 15 years.

Patients were enumerated by commune of residence. Expected numbers of new cases were calculated for each year and commune, based upon the sex and age profile in the commune in relation to totals for the county. The chi-square test was used to evaluate observed differences in the age groups 15-44, 45-64, 65-74, and 75 years and older, during the entire 4-year period.

Age was calculated from year of birth to date of first report for each discrete episode of illness.

A patient treated both within and outside the county was enumerated according to data from within-county sources only. If the patient's place of residence changed within the county, then the earliest reported residence was used throughout, since change of residence was so rarely observed in reports of new illness episodes.

Sources of error

Complete person-number was available for most discharges and care episodes. When incomplete, date of birth was always available. Discharges and care episodes for patients of the same sex and date of birth were regarded as belonging to the same patient, if insurance-office code was also the same. The extent of incorrect linkages could be estimated on the basis of the proportion of incomplete person-numbers. For men, the proportion of care episodes in which no discharge provided a complete person-number was 35, 8, 6, 5 and 3 percent, respectively, for the years 1975-1979.

Since only a few persons in each commune were born on the same date, while at the same time the proportion of incomplete person-numbers was low, the number of incorrect linkages must have been negligible. This was also true for missed linkages, due to the patient having left the commune.

Loss of data

Material was not included on care episodes at facilities outside the county. For 1979, 1 percent of care episodes were lost due to visits in neighboring Malmö Commune and Kristianstad County. Also excluded from the material were patients at chronic care or psychiatric institutions who were not admitted to any emergency unit. Such care episodes relating to acute myocardial infarction occurred primarily among elder patients and, in 1978, accounted for 3.9 percent of all discharges in the diagnosis.

Patients who died before admission to hospital were also excluded. A comparison was made with data on deaths in Hörby and Höör parishes during 1974-1978, where acute myocardial infarction was the registered, underlying cause of death for 65 persons. In PAS (inpatient), 29 of these had been registered with this diagnosis during the same period.

This difference can be explained in part by coding practice in the cause-of-death material at the National Central Bureau of Statistics. "Certain diagnoses are given priority under the heading, underlying cause of death, regardless of how the death certificate has been written. If both myocardial infarction and chronic ischemic heart disease appear on the death certificate, then myocardial infarction is coded as the underlying cause, which may come into conflict with the definition of underlying cause." (45).

The combined losses of data effectively prevent any generalization of results as representative of the entire incidence of acute myocardial infarction. The real incidence can be somewhat higher than that found in the present study. However, this should not affect comparisons between communes or annual trends.

Interrelation between diabetes mellitus and acute myocardial infarction

Interrelation between diabetes mellitus and acute myocardial infarction was investigated for patients with residence in Landskrona Commune. The reason for selecting this population was that both diagnoses were over-represented in comparison with Malmöhus County at large. The number of diabetics was 648 during the period 1975-1979, while the number of illness episodes in myocardial infarction for 1976-1979 was 554.

Starting from the manually processed computer listings, a new list was prepared with person-number for all patients with either diabetes or myocardial infarction or both. The chi-square test was used to evaluate the interrelationship between these diagnoses in the population of the commune as of December 31, 1977. A further comparison was made of the incidence of myocardial infarction between the diabetic and nondiabetic populations. The same method has been described in another study (46).

In order to investigate whether the over-representation of myocardial infarction in Landskrona Commune could be explained by an over-representation of diabetics, the material was adjusted in the following way. The difference between observed and expected numbers of diabetics in the

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commune was re-distributed theoretically, according to age and sex, in relation to the distribution of diabetics in the total population of the county. A theoretical number of new cases of myocardial infarction was then calculated for those diabetics and subtracted from the observed values for Landskrona Commune and Malmöhus County. A new chi-square test was then applied to the revised incidence of myocardial infarction in Landskrona as compared with the entire county.

Asthma

Prevalence

An attempt was made to determine the prevalence of asthma (ICD 493) by an analysis of outpatient visits and inpatient discharges. Information about all visits and discharges within the Ystad Medical District, with asthma as primary diagnosis, was obtained from computer lists for the period April 1 to November 30, 1981. The material was sorted by sex and date of birth. Outpatient lists contained information on sex, person-number, age, postal code, care unit, primary diagnosis (5-digits), and date of visit. Inpatient lists contained sex, person-number, name, age, insurance office, primary diagnosis (5-digits), clinic, date of admission, and date of discharge. The lists were processed manually. Patients from other districts were first deleted and then the linkages established for multiple care episodes and visits. Prevalence was calculated for the age groups 0-14, 15-44, 45-64, 65-74, and 75 years and older, and for both sexes. Age was calculated as of first registered contact.

Loss of Data

Visits to the emergency center in Ystad and to the reception in Lövestad were not registered with diagnosis. Visits and care episodes in other medical districts were not included. For all diagnoses, the proportion of visits within the home district was 85 percent in 1979 and the corresponding proportion of care episodes in 1978 was 72 percent. The specific proportions among asthma patients was not known.

Rheumatoid arthritis

Prevalence

In the Skurup district, a model program has been worked out for the care of rheumatic patients (47, 48). Case finding is an important objective of the program. The great majority of rheumatic patients in the commune is therefore known.

At the medical center a register is maintained for rheumatic residents in need of care. Information on person-number and name was obtained from this register in order to investigate the consumption of care by patients with rheumatoid arthritis (ICD 712) at other units as well. Comparisons were made with the population of Sjöbo Commune, where no such model exists.

Computer lists were obtained showing in- and outpatient contacts at the hospitals in Lund and Ystad, during 1979, for residents of Skurup and Sjöbo communes. At the hospital in Ystad, patients with rheumatoid arthritis had been treated at the medical clinic and orthopedic department, while at the hospital in Lund, such patients were treated at the rheumatological and orthopedic clinics. For those units, where diagnosis was not included in the statistical system, all patient journals were examined manually in the search for rheumatoid arthritic patients, with the help of lists. Age was calculated from year of birth.

Diagnoses were registered during the second half of 1980 at the medical center in Sjöbo. Information about rheumatoid arthritic patients during this period was used for comparison, in order to obtain a complete picture of the care of such patients in Sjöbo.

A second search of the patient journals was also made, in order to identify all rheumatoid arthritic patients from the two communes, who had received treatment during 1979 at the hospital clinics. Notation was then made about circumstances leading to the visit, reason for admission to inpatient care, and type of outpatient care.

For all patients, the linking of records from various episodes and clinics was carried out manually.

Juvenile rheumatoid arthritis

Registers at the medical center in Skurup did not include children with juvenile rheumatoid arthritis. An attempt was made to determine the prevalence of this disease through an analysis of outpatient visits and discharges after inpatient care.

Information about all visits and discharges at the rheumatological clinic in Lund, with juvenile rheumatoid arthritis as primary or secondary diagnosis, was retrieved with the aid of computer lists for each calendar year during the period 1978-1981. The material was arranged according to sex and date of birth, and it included information on sex, person-number, name (inpatients), age, dates of admission and discharge (inpatients), date of visit (outpatients), type of diagnosis (inpatients), planned or acute visit (outpatients), new or return visit (outpatients), insurance office (inpatients), and postal code (outpatients).

The lists were processed manually. Care episodes and visits by non-resident patients were deleted, and record linkages then established for remaining patients during the entire time period. Any patient with at least one registered contact as a county resident was included, even though the patient may have moved into or from the county during the period. Prevalence was calculated for the age groups 0-4, 5-9, and 10-14 years. Age was calculated as of the first registered contact.

The pediatric section of the rheumatological clinic in Lund was the only facility in Sweden, specifically organized for the treatment of juvenile rheumatoid arthritis. It is probable that most children with this disease,

who were resident in Malmöhus County, came into contact with the clinic at some time during the period of the study.

The population base for this age group was taken as the sum of the number of persons in Malmöhus County on December 31, 1978 plus the numbers born and immigrated during the period 1979-1981.

Injuries due to motor-vehicle accidents

Incidence of injuries due to motor-vehicle accidents (ICD E810 to E823) was estimated through the analysis of discharges after inpatient care. Computer lists provided information on all discharges of county-resident patients under 15 years of age from all somatic care clinics in Malmöhus and Kristianstad County and Malmö Commune, following inpatient care for injuries due to motor-vehicle accidents. Lists were separate for each administrative jurisdiction and calendar year during the period 1970-1979. The material was sorted by sex and date of birth and ICD E-code. For each care episode, notation was made of E-code, person-number, age, sex, insurance office, hospital, clinic, dates of admission and discharge, number of care days, types of admission and discharge, and primary diagnosis.

The material was processed for decimal codes ".1", which identifies passengers in motor-vehicles except motorcycles, ".6", which identifies pedal-cyclists, and ".7", which identifies pedestrians (35).

Care episodes for patients with identical person-numbers were linked. In the absence of complete person-number, the care episode was regarded as affecting the same patient if sex, date of birth, and insurance code were the same. In order to avoid the unintended linkage of records from multiple accidents, care episodes were regarded as contiguous if they occurred within 2 consecutive years and with the same E-code. The average, annual incidence for the entire period, 1970-1979, was calculated in relation to the population as of December 31, 1974.

The patients were also enumerated by commune of residence. For each year, expected numbers of patients were estimated by commune on the basis of total frequencies for Malmöhus County, taking into account the age distribution of the commune. The chi-square test was used to evaluate differences found for the entire 10-year period in the age groups 0-4, 5-9, and 10-14 years.

The incidence was calculated according to the formula $KI_t = \sum jIR_j$, where KI_t is the cumulative incidence rate for age interval t and $\sum jIR_j$ is the sum of age-specific incidence rates over j age groups (42).

Loss of data

Diagnoses within the ICD interval 800-999, which indicate injury due to external violence and poisoning (nature of injury), are supplemented by an E-code, indicating cause of accident. Presence of the E-code is checked by computer for diagnoses within the given interval.

The decimal code ".9" indicates an unspecified traffic category. The proportion of all patients with this code was 1.3 percent. This loss was therefore regarded as negligible.

IV RESULTS OF ANALYSIS OF POPULATION AND INDIVIDUAL BASED MATERIAL

1 QUALITY OF THE STATISTICAL SYSTEMS

Quality of the data

The proportion of records in the PAS (inpatient) having incomplete person-number was investigated for breast cancer, myocardial infarction, and diabetes (in the latter case, including secondary diagnosis). These diagnoses accounted for 9 percent of all care episodes excluding deliveries. Incomplete person-number occurred in 6.9 percent of episodes in 1977, 5.4 percent in 1978, and 3.8 percent in 1979. Errors in person-number were investigated for patients with breast cancer. Of the 2,462 care episodes reported for 1975-1977, 20 (or 0.8 percent) carried an incorrect person-number.

In PAS (outpatient), person-number was incomplete in 3.3 percent of all registered visits during 1979. Corresponding proportions were 2.5 percent in 1980 and 1.4 percent for the period of January-October, 1981. The highest proportion (about 4 percent) during the same months of 1981, was observed in reports from pediatric and emergency receptions.

Information on sex was compared with the ninth digit of the person-number. Complete agreement between codes was observed in 1,117 episodes involving women with breast cancer during 1979, and in 1,212 visits by men during the first quarter of 1980 to the medical center in Skurup, the hospital in Ystad and the hospital in Lund.

Incorrect registration of age was observed in 4 of the 20 episodes of breast cancer previously identified as having incorrect person-numbers.

Information about place of residence was checked by investigating, for the period 1970-1979, the number of records in PAS (inpatient) having no insurance-office code. Out of a total of 605,999 care episodes involving patients residing in Malmöhus County, the insurance code could not be identified for 2,504 episodes, or 0.4 percent (Table IV).

Table IV. Number of care episodes with unidentified insurance-office code, for patients from Malmöhus County, 1970-1979.

Year	Care episodes 12..	Care episodes 12xx	Unidentified	
			Number	Percent
	1	2	3	4
1970	52,589	51,911	678	1.3
1971	55,570	55,144	426	0.8
1972	57,689	57,378	311	0.5
1973	59,276	59,043	233	0.4
1974	60,312	59,742	570	0.9
1975	59,818	59,628	190	0.3
1976	64,062	64,016	46	0.1
1977	65,662	65,619	43	0.1
1978	65,878	65,871	7	0.0
1979	65,143*	65,143	0	0.0
Total	605,999	603,495	2 504	0.4

* Totals were not processed for 1979; number of care episodes assumed on basis of column 2.

For women who had developed breast cancer during 1977, insurance-office codes were compared with information in the tumor register. According to PAS (inpatient), there were 285 such cases from Malmöhus County in 1977. Of these, 227 were found in the tumor register as county residents during that year.

Insurance-office code and commune code were in agreement for 205 patients. Inconsistencies depended in 6 cases upon the drawing of boundary lines within Lund Commune, and in 3 cases upon the use of an older commune code in the tumor register.

Altogether, 13 inconsistent code numbers were found. In 9 of these, a nonexistent commune code appeared in the tumor register, but the code number was found to belong to the "right" commune prior to a recent revision of boundaries. The remaining 4 patients had different but existing codes in the two sources; in each of these the differing codes referred to adjacent communes and it is likely, therefore, that different place-of-residence names had been reported to the two registers.

About 2 percent of households had a postal code that could not be unambiguously associated with a given commune (49).

In total, the differences effectively cancelled out each other, except for those involving Kristanstad County and Malmö Commune. Discrepancies for various communes are shown in Table V.

Table V. Discrepancies between commune boundary and postal code, 1977-1978.

Commune	Number of house-holds in commune	With divisions according to postal-code area			
		Increase	Decrease	Net Change	Percent
Bjuv	5,806	9	34	-25	0.4
Helsingborg	49,692	18	608	-590	1.2
Höganäs	8,973	0	31	-31	0.3
Landskrona	18,265	100	340	-240	1.3
Svalöv	5,372	288	95	193	3.6
Burlöv	5,877	94	5	89	1.5
Kävlinge	7,914	50	134	-84	1.1
Lomma	5,989	0	119	-119	2.0
Lund	43,809	1,193*	132	1,061	2.4
Staffanstorp	5,614	11	907**	-896	16.0
Eslöv	11,538	621	187	434	3.8
Hörby	5,159	51	192	-141	2.7
Höör	4,667	150	417	-267	5.7
Svedala	5,573	47	118	-71	1.3
Trelleborg	15,205	23	203	-180	1.2
Vellinge	8,463	13	5	8	0.1
Sjöbo	6,176	65	251	-186	3.0
Skurup	5,369	618	61	557	10.4
Ystad	11,399	5	450	-445	3.9
Total	230,858	3,356	4,289	-933	0.4

* Including 789 Staffanstorp

** Including 789 Lund

For women registered with breast cancer in PAS (inpatient), information about diagnosis was compared with that contained in the tumor register. For 12 episodes out of a total of 2,462 (or 0.5 percent, affecting 11 patients), diagnosis was incorrectly registered in PAS (inpatient) with respect to stage of disease or metastatic spread.

During 1973 and 1974, there occurred about 150-200 care episodes in which the code for pharmaceuticals was erroneously registered as diagnosis code (personal communication, 1981).

Discussion

For all county councils using PAS (inpatient), insurance-office code was incorrect in 0.5 percent of all care episodes (50). Accuracy of diagnosis coding can vary, depending at least in part on an inadequate knowledge of the classification system (51).

The examination carried out in the present study shows that the quality of the data is not particularly high for the postal-code variable. For other

variables few errors were found, but validity of diagnosis should be investigated for other diseases besides breast cancer.

Quality of the system

For 1974-1976, a total of 508 records is reported to have been removed from PAS (inpatient) due to incompleteness. Losses due to a missing register for 1975 were estimated to represent about 560 care episodes at each of two hospitals: those in Ystad and Landskrona. This was the equivalent of about 13 percent of all care episodes at these hospitals during 1975.

A comparison between PAS (outpatient) and manual registrations for 1979 showed that 99.3 percent of all visits to facilities included in the study were present in the computer files. Losses were greater in 1977 and 1978, because some facilities had not yet begun to register their visits in PAS (outpatient). At the clinic for child psychiatry in Lund and its counterpart in Landskrona, visits were not registered in PAS (outpatient).

Regarding age information in PAS (inpatient), no losses were found among the 65,662 care episodes of 1977, nor among the 65,878 episodes of 1978. In PAS (outpatient), on the other hand, there were losses of age data at several clinics. The largest losses occurred at pediatric clinics and at both hospital and non-hospital emergency units. In a material covering visits to care and medical service units during 1979, information on age was missing in 9,103 out of a total of 1,298,348 visits. This gave a loss of 0.7 percent. The corresponding loss at pediatric medical units was 8.5 percent.

Information on sex was investigated in PAS (outpatient) for visits to the emergency department at the hospital in Lund, during May, 1979. Sex was found to be registered for all of 2,284 visits.

Place of residence was not missing for any care episode among patients from Malmöhus County during 1979. Postal code, however, was missing for 1,892 out of 273,310 visits included in PAS (outpatient) for Helsingborg Medical District in 1979. This represented a loss of 0.7 percent. The largest loss, 1.9 percent, occurred among visits to non-hospital emergency receptions. The medical center in Bjuv was not included in this comparison, since postal code was not registered there during the period in question. Nor was postal code registered during January to July, 1979, at the gynecology reception of the hospital in Landskrona.

A comparison was made of information about patients with breast cancer as reflected in PAS (inpatient) and the regional tumor register (RTR). The numbers of new cases per year, 1975-1977, are shown in Table VI.

Table VI. Numbers of new cases of breast cancer, Malmöhus County, 1975-1977.

Year	PAS Inpatient	RTR
1975	224*	222
1976	253**	262
1977	285	268
Total	762	752

* Includes 3 patients, incorrectly classified at first processing as earlier onset (cf. Table XXIV).

** Includes 1 patient, incorrectly classified at first processing as earlier onset (cf. Table XXIV).

Numbers of new cases differed by 6 percent, at most, in any given year.

For residents of Malmöhus County, 752 new cases of breast cancer were reported to the RTR during the period 1975-1977. After corrections and additions, this number rose to 759.

The following errors and losses were found in PAS (inpatient). An incorrect diagnosis had been assigned to 8 patients, while 3 additional patients were found to have cancer in situ rather than metastatic breast tumors.

Person-number was wrong for 16 patients. For 11 of these, the patient was consequently counted (incorrectly) as a new patient during the period. For 14 of the patients, the correct person-number was reported in connection with other care episodes. The total error in the material was thus 3.5 percent.

Other discrepancies were also found, which affected comparisons with the RTR. For 5 patients, county of residence was coded as Malmöhus in PAS but as some other county in the RTR. These differences may well depend upon the patient having moved into the county. Correct linkages of episodes were missed for 4 patients, due to incomplete person-number and differing commune codes for some episode. This could have been avoided, had name been registered in full. These errors represented 1.2 percent of all patients.

Onset during another year or in another region was found for 97 patients. One of these had developed the disease while outside the country and was therefore not registered in the RTR, while 8 had been diagnosed previously in some other region. One patient had been diagnosed in another region during the same year. Of patients who were diagnosed within the region, 87 did not agree as to year of first registration.

Information was missing for 48 patients. This corresponded to 6.3 percent of all new, primary cases according to PAS (inpatient). For 7 of these

patients, the reason was that they had been treated at some facility, within or outside the county, not included in the underlying material. A further 13 patients had been treated as outpatients, only. The remaining 28 patients were lost, either due to having been registered under another diagnosis or due to not having been registered at all.

The primary match included 618 patients. After correction of errors in person-number, affecting 1 care episode for each of 10 additional patients, the material was in agreement for 628 patients (Table VII).

Table VII. Numbers of new cases of breast cancer, by age of patient, Malmöhus County, 1975-1977.

Age Group	PAS (inpatient) (patients)	RTR Corrected (tumors)	Identical within the same calendar year
-29	4	5	3
30-34	9	9	8
35-39	19	17	15
40-44	41	43	38
45-49	61	69	55
50-54	77	77	70
55-59	57	58	44
60-64	110	106	93
65-69	107	100	84
70-74	95	93	80
75-79	75	71	56
80-84	51	54	43
85+	56	57	39
Total	762	759	628

Only a few patients were registered at exactly the same time in the two registers. Enumeration by calendar year led to an agreement between the two sources of approximately 80 percent. This discrepancy could have been reduced by the use of a lag-time interval rather than calendar year.

Discussion

The study of data registers has several advantages, such as access to a large number of cases, uniformity of data collection, and the possibility of carrying out longitudinal observations in time. If registers are to function as valid, etiological tools, the data must meet high standards of quality. Goldberg et al., in their report on methods for the evaluation of registers (52), point out that problems of loss and validity are not limited to specific diseases or circumstances. Experiences in the development of existing registers should therefore be taken into account, when developing new disease-specific or other registers.

Quality control must be included as an important function in the continued use and development of statistical systems. This principle has frequently been neglected, but is a necessary condition if the usability of results from various studies is to be appraised.

Diagnoses in inpatient careNumbers of care episodes

Among the entire population, 20 diagnoses were found to represent at least 1.5 percent of all care episodes during at least one year in the decade of the 1970's. Of these diagnoses acute myocardial infarction, chronic ischaemic heart disease, and cerebrovascular disease were further subdivided according to the presence or absence of hypertension.

Average numbers of care episodes per year, together with regression and correlation coefficients for trends during the period of study, are shown in Table VIII. Corresponding information for various age groups is shown in Tables IX to XIII.

The statistical significance of coefficients of correlation was evaluated using the t-test. For $p < 0.001$, the coefficient of correlation must have an absolute value > 0.87 .

Using this probability level, a number of diseases, in the age groups 0-14 and 15-44 years, showed a downward trend during the period, while no other diseases were on the increase. In the remaining age groups, on the other hand, several diseases showed upward trends, while only a few were on the decrease.

Table VIII. Mean episode rates per diagnosis and 100,000 residents, Malmöhus County, 1970-1979.

	Diagnosis	Epi- sode rate	Regression Coefficient	Coefficient of Corre- lation
174	Malignant neoplasm of breast	135	16.02	0.86
250	Diabetes mellitus	226	1.28	0.28
410 (part of)	Acute myocardial infarction with hypertension	38	1.59	0.93
410 (part of)	Acute myocardial infarction without hypertension	290	20.25	0.94
412 (part of)	Chronic ischaemic heart disease with hypertension	22	-1.15	-0.72
412 (part of)	Chronic ischaemic heart disease without hypertension	145	-1.76	-0.40
427	Symptomatic heart disease	287	20.96	0.94
430-438 (part of)	Cerebrovascular disease with hypertension	96	2.65	0.63
430-438 (part of)	Cerebrovascular disease without hypertension	213	13.67	0.92
460-474	Acute respiratory infections and influenza	236	-5.34	-0.57
480-486	Pneumonia	218	7.03	0.75
493	Asthma	204	1.34	0.22
501-519	Other diseases of upper respi- ratory tract and of respiratory system (excludes: see p 29)	327	-4.45	-0.64
531-535	Ulcer of stomach, ulcer of duo- denum, peptic ulcer, gastroje- junal ulcer, and gastritis and duodenitis	182	-10.58	-0.95
540-543	Appendicitis	156	-4.62	-0.86
550-553	Hernia of abdominal cavity	264	-11.79	-0.80
574	Cholelithiasis	212	-14.33	-0.90
590,591,593, 595-599	Other diseases of urinary system (excludes: see p 30)	233	-16.42	-0.87
740-759	Congenital anomalies	218	-7.42	-0.81
785	Symptoms referable to abdomen and lower gastro- intestinal tract	470	7.18	0.75
793	Observation, without need for further medical care	211	7.18	0.68
850	Concussion	211	0.07	0.00
Y00-Y79	Supplementary classifications	278	18.09	0.60

Table IX. Mean episode rates per diagnosis and 100,000 residents, in the age group 0-14 years, Malmöhus County, 1970-1979.

	Diagnosis	Epi- sode rate	Regression Coefficient	Coefficient of Corre- lation
008-009	Enteritis due to other specified organism and diarrhoeal disease	454	-7.00	-0.28
373	Strabismus	109	-6.30	-0.59
381-383	Otitis media and mastoiditis	197	-1.12	-0.14
460-474	Acute respiratory infections and influenza	675	-25.64	-0.79
480-486	Pneumonia	228	7.00	0.54
493	Asthma	155	-23.53	-0.87
500	Hypertrophy of tonsils and adenoids	205	-20.55	-0.78
501-519	Other diseases of upper respiratory tract and of respiratory system (excludes: see p 29)	841	-33.61	-0.78
540-543	Appendicitis	182	-2.10	-0.37
550-553	Hernia of abdominal cavity	188	-11.17	-0.91
590,591, 593	Other diseases of urinary system			
595-599	(excludes: see p 30)	328	-21.10	-0.84
605	Redundant prepuce and phimosis	127	-20.81	-0.93
740-759	Congenital anomalies	721	-21.30	-0.76
760-779	Certain causes of perinatal morbidity and mortality	752	16.31	0.74
780	Certain symptoms referable to nervous system and special senses	154	-2.68	-0.35
785	Symptoms referable to abdomen and lower gastro-intestinal tract	554	-4.27	-0.45
793	Observation, without need for further medical care	145	-7.99	-0.78
850	Concussion	352	10.90	0.79
Y00-Y79	Supplementary classifications	230	4.14	0.35

Table X.

Mean episode rates per diagnosis and 100,000 residents, in the age group 15-44 years, Malmöhus County, 1970-1979.

	Diagnosis	Episode rate	Regression Coefficient	Coefficient of Correlation
234	Neoplasm of unspecified nature of uterus	94	3.44	0.50
250	Diabetes mellitus	138	1.48	0.55
500	Hypertrophy of tonsils and adenoids	138	-13.06	-0.94
501-519	Other diseases of upper respiratory tract and of respiratory system (excludes: see p 29)	135	-4.15	-0.79
531-535	Ulcer of stomach, ulcer of duodenum, peptic ulcer, gastrojejunal ulcer, and gastritis and duodenitis	108	-7.11	-0.98
540-543	Appendicitis	209	-7.68	-0.87
550-553	Hernia of abdominal cavity	102	-9.79	-0.88
574	Cholelithiasis	167	-17.12	-0.90
580-584	Nephritis and nephrosis	56	-5.95	-0.60
590,591,593	Other diseases of urinary system (excludes: see p 30)	105	-12.66	-0.79
595-599	Salpingitis and oophoritis	137	-2.90	-0.39
612-614	Disorders of menstruation	109	-13.22	-0.92
626	Haemorrhage of pregnancy	90	-7.25	-0.81
632	Other complications of pregnancy	283	-35.54	-0.79
634	Pre-eclampsia, eclampsia and toxæmia unspecified	140	-21.38	-0.81
637	Abortion induced for medical and for other legal indications	178	-22.57	-0.93
640,641	Spontaneous abortion	280	-3.72	-0.64
643	Internal derangement of joint	136	5.61	0.67
724	Symptoms referable to abdomen and lower gastro-intestinal tract	456	6.62†	0.61
785	Observation, without need for further medical care	130	1.63	0.24
793	Concussion	202	-5.92	-0.93
850	Supplementary classifications	360	34.66	0.52
Y00-Y79				

Table XI. Mean episode rates per diagnosis and 100,000 residents, in the age group 45-64 years, Malmöhus County, 1970-1979.

	Diagnosis	Epi- sode rate	Regression Coefficient	Coefficient of Corre- lation
162	Malignant neoplasm of trachea, bronchus, and lung	127	15.16	0.72
174	Malignant neoplasm of breast	322	55.20	0.85
183	Malignant neoplasm of ovary, fallopian tube, and broad liga- ment	197	18.68	0.80
250	Diabetes mellitus	235	-2.70	-0.28
400-404	Hypertensive disease	139	-7.00	-0.71
410 (part of)	Acute myocardial infarction with hypertension	51	2.08	0.57
410 (part of)	Acute myocardial infarction without hypertension	389	24.70	0.89
411,413-414	(See p 29)	173	18.39	0.95
412 (part of)	Chronic ischaemic heart disease with hypertension	23	-1.28	-0.57
412 (part of)	Chronic ischaemic heart disease without hypertension	128	-1.96	-0.24
427	Symptomatic heart disease	244	15.24	0.79
430-438	Cerebrovascular disease (part of) with hypertension	102	3.94	0.59
430-438	Cerebrovascular disease (part of) without hypertension	179	11.00	0.88
440-445	(See p 29)	155	5.10	0.55
454	Varicose veins of lower extremities	261	-21.46	-0.83
493	Asthma	263	7.53	0.65
501-519	(See p 29)	184	5.05	0.75
531-535	(See p 30)	300	-19.72	-0.91
550-553	Hernia of abdominal cavity	387	-23.13	-0.83
574	Cholelithiasis	335	-17.53	-0.81
590,591,593	Other diseases of urinary system (excludes: see p 30)	199	-24.16	-0.77
595-599	(See p 30)	172	-3.75	-0.65
592, 594	Disorders of menstruation	182	-9.56	-0.65
626	Rheumatoid arthritis and allied conditions	252	-4.74	-0.53
712	Osteo-arthritis and allied conditions	219	9.05	0.69
713	Congenital anomalies	85	-7.37	-0.46
740-759	Symptoms referable to cardio- vascular and lymphatic system	128	24.56	0.90
782	Symptoms referable to abdomen and lower gastro-intestinal tract	302	10.70	0.85
785	Observation, without need for further medical care	279	17.60	0.84
793	Supplementary classifications	167	5.36	0.55
Y00-Y79				

Table XII.

Mean episode rates per diagnosis and 100,000 residents, in the age group 65-74 years, Malmöhus County, 1970-1979.

	Diagnosis	Epi- sode rate	Regression Coefficient	Coefficient of Corre- lation
153	Malignant neoplasm of large intestine, except rectum	300	16.48	0.73
162	Malignant neoplasm of trachea, bronchus, and lung	350	26.18	0.72
174	Malignant neoplasm of breast	340	16.96	0.87
185	Malignant neoplasm of prostate	289	3.45	0.42
188	Malignant neoplasm of bladder	354	10.63	0.66
250	Diabetes mellitus	537	-9.38	-0.57
410 (part of)	Acute myocardial infarction with hypertension	167	11.48	0.92
410 (part of)	Acute myocardial infarction without hypertension	1101	79.75	0.94
411, 413-414	(See p 29)	397	48.76	0.94
412 (part of)	Chronic ischaemic heart disease with hypertension	76	-5.84	-0.73
412 (part of)	Chronic ischaemic heart disease without hypertension	389	-14.27	-0.76
427	Symptomatic heart disease	870	49.77	0.92
430-438 (part of)	Cerebrovascular disease with hypertension	377	12.83	0.78
430-438 (part of)	Cerebrovascular disease without hypertension	660	42.07	0.92
440-445	(See p 29)	383	19.63	0.85
450-453	(See p 29)	379	22.76	0.92
480-486	Pneumonia	394	10.57	0.60
490-492	Bronchitis and emphysema	314	14.27	0.66
493	Asthma	579	17.32	0.71
531-535	(See p 30)	411	-24.95	-0.91
550-553	Hernia of abdominal cavity	605	-4.70	-0.20
574	Cholelithiasis	605	-24.75	-0.89
575	Cholecystitis and cholangitis, without calculus	206	-13.20	-0.75
590,591,593	Other diseases of urinary system (excludes: see p 30)	342	-19.85	-0.85
595-599	Hyperplasia of prostate	500	13.64	0.47
600	Rheumatoid arthritis and allied conditions	361	12.70	0.63
712	Osteo-arthritis and allied conditions	449	36.99	0.77
713	Symptoms referable to cardiovascular and lymphatic system	213	44.98	0.91
782	Symptoms referable to abdomen and lower gastro-intestinal tract	465	7.78	0.58
793	Observation, without need for further medical care	367	21.23	0.69
820	Fracture of neck of femur	370	9.42	0.78

Table XIII. Mean episode rates per diagnosis and 100,000 residents, in the age group 75+ years, Malmöhus County, 1970-1979.

	Diagnosis	Epi- sode rate	Regression Coefficient	Coefficient of Correlation
153	Malignant neoplasm of large intestine, except rectum	443	4.67	0.26
185	Malignant neoplasm of prostata	540	3.76	0.20
250	Diabetes mellitus	919	18.48	0.52
374	Cataract	618	22.48	0.71
410 (part of)	Acute myocardial infarction with hypertension	186	-1.10	-0.14
410 (part of)	Acute myocardial infarction without hypertension	1624	108.36	0.92
411, 413-414	(See p 29)	458	64.27	0.94
412 (part of)	Chronic ischaemic heart disease with hypertension	171	-6.98	-0.50
412 (part of)	Chronic ischaemic heart disease without hypertension	1328	-15.53	-0.26
427	Symptomatic heart disease	2402	185.25	0.95
430-438	Cerebrovascular disease with hypertension	635	5.96	0.20
430-438	Cerebrovascular disease without hypertension	1738	107.77	0.86
440-445	(See p 29)	826	36.05	0.77
450-453	(See p 29)	621	29.02	0.76
460-474	Acute respiratory infections and influenza	373	12.32	0.30
480-486	Pneumonia	1368	48.52	0.53
493	Asthma	413	44.13	0.93
501-519	(See p 29)	429	40.25	0.89
531-535	(See p 30)	539	-9.47	-0.53
550-553	Hernia of abdominal cavity	672	7.58	0.22
574	Cholelithiasis	473	-13.99	-0.76
575	Cholecystitis and cholangitis, without calculus	445	-26.29	-0.69
590,591,593, 595-599	Other diseases of urinary system (excludes: see p 30)	730	4.72	0.14
600	Hyperplasia and prostate	795	17.54	0.44
713	Osteo-arthritis and allied conditions	455	46.03	0.90
785	Symptoms referable to abdomen and lower gastrointestinal tract	905	23.94	0.54
793	Observation, without need for further medical care	518	40.67	0.88
820	Fracture of neck of femur	1676	43.30	0.69

Care episodes per commune

The regional pattern of numbers of care episodes during 1975-1979 was studied for breast cancer in females, diabetes mellitus, and acute myocardial infarction. The material was adjusted in relation to the populations of various communes (Lund and Staffanstorp were combined), and expected frequencies were calculated. Significant deviations from the expected ($p < 0.001$) were found for female breast cancers in Landskrona, Svalöv, Burlöv, and Lomma communes, and for diabetes mellitus in Landskrona, Höör, Skurup, and Ystad communes. Significant deviations for acute myocardial infarction were found in 15 out of 18 communes.

Discussion

Information about the numbers of care episodes and care days associated with various diagnoses, and their trends in time, is a valuable element in the planning of health care activities. It is important to remember, however, that the material can only provide an indirect impression of the disease panorama in the population, since all data are affected by existing routines and practice in the health services. The diagnosis, breast cancer, can be mentioned as an example, where the number of care episodes increased by a factor of 2.67 times during the 10-year period. This depended not upon an increased number of occurrences of the disease (Table XXIV), but rather on the fact that treatment changed from a few to several care episodes during the course of the disease.

Treatment procedures may vary not only in time but between clinics. Different hospitals may have different procedures or criteria for admission, transferral or readmission, in relation to a particular disease, thereby affecting the registered number of episodes for that disease. Differences in care episodes between various population groups need not, therefore, be interpreted as necessarily representing real differences in the occurrence of the disease. This relationship has not always been adequately observed (53). When processing material for the entire country, the attempt has been made to circumvent this problem by recognizing only one care episode per individual and year, for the primary diagnosis in question (19). This improves the possibility for studying regional variations, but the method is not always sufficient, since it is possible for one illness to last longer than one year, while another illness may occur several times during one year, in the same patient.

Diagnoses in outpatient care

Numbers of visits

The total number of outpatient visits with diagnosis and information about the patient's age and sex was 70,322. These were distributed by chapters in the WHO-classification as in Table XIV. For the most frequently occurring specific diagnoses, the numbers of visits per 100 residents are shown in Table XV.

Table XIV Number of visits per diagnostic group, sex, and age group per 100 residents, Ystad Medical District, April 1 - December 31, 1981.

	Diagnostic group	Sex	Age Group (years)					Total
			0-14	15-44	45-64	64-74	75+	
I	Infective and parasitic diseases	M	5.6	3.1	1.8	1.8	2.8	3.1
		F	4.8	3.9	2.4	3.3	2.2	3.5
II	Neoplasms	M	0.5	1.0	2.2	7.7	13.6	2.8
		F	0.9	3.0	4.1	4.8	5.9	3.4
III	Endocrine, nutritional, and metabolic diseases	M	0.9	2.1	5.7	14.1	14.6	4.9
		F	0.9	2.6	6.5	17.1	17.5	6.4
IV	Diseases of blood and blood-forming organs	M	0.2	0.1	0.3	1.0	2.4	0.4
		F	0.3	0.4	1.4	1.8	1.9	0.9
V	Mental disorders	M	6.5	4.7	9.8	3.9	4.9	6.1
		F	5.2	6.3	9.0	9.5	7.1	7.2
VI	Diseases of the nervous system and sense organs	M	43.4	9.2	15.8	28.3	44.6	22.0
		F	39.8	12.7	16.7	36.3	53.6	25.6
VII	Diseases of the circulatory system	M	0.4	2.4	19.2	49.5	53.2	14.6
		F	0.3	2.8	19.3	50.8	63.5	18.0
VIII	Diseases of the respiratory system	M	21.9	9.7	8.3	10.1	12.1	12.0
		F	18.4	17.2	10.7	8.1	6.1	13.7
IX	Diseases of the digestive system	M	1.4	2.7	4.2	7.2	5.8	3.5
		F	1.1	3.5	4.4	5.8	5.1	3.7
X	Diseases of the genito-urinary system	M	1.8	2.6	4.4	7.8	12.8	4.2
		F	2.3	17.4	13.2	10.0	8.4	11.9
XI	Complications of pregnancy, childbirth, and the puerperium	M	-	0.0	0.1	-	-	0.0
		F	0.2	0.5	0.1	0.1	0.1	0.3
XII	Diseases of the skin and subcutaneous tissue	M	4.4	3.9	2.3	3.2	5.2	3.7
		F	4.4	4.6	2.9	4.4	3.5	4.1
XIII	Diseases of the musculoskeletal system and connective tissue	M	2.4	9.7	14.7	14.8	11.8	10.1
		F	2.6	9.6	19.1	20.0	18.2	12.6
XIV	Congenital anomalies	M	1.0	0.2	0.2	0.3	0.3	0.4
		F	0.8	0.4	0.4	0.5	0.0	0.4
XV	Certain causes of perinatal morbidity and mortality	M	-	-	-	-	-	-
		F	0.1	0.0	0.0	0.0	-	0.0
XVI	Symptoms and ill-defined conditions	M	8.5	6.6	7.2	16.0	17.2	8.9
		F	8.4	12.3	13.4	15.7	14.3	12.4
XVII	Accidents, poisonings, and violence (nature of injury)	M	9.3	16.7	10.5	6.3	8.4	12.1
		F	6.6	6.4	7.2	7.6	9.4	7.1
Y00-Y89	Supplementary classifications	M	16.1	12.1	10.7	14.7	19.1	13.4
		F	20.9	28.0	18.5	15.7	19.5	22.2
Total		M	124.4	86.9	117.4	186.7	228.7	122.2
		F	118.0	131.8	149.2	211.3	236.3	153.3

Table XV. Number of visits per diagnosis and age group, per 100 residents, Ystad Medical District, April 1 - December 31, 1981.

	Diagnosis	Age Group (years)					Total
		0-14	15-44	45-64	65-74	75+	
079	Other viral diseases	1.9					
250	Diabetes mellitus		1.5	4.6	13.5	14.7	4.5
296	Affective psychoses			2.0			
300	Neuroses		2.6	3.2			2.2
303	Alcoholism			2.6			
306	Special symptoms	5.3					
360	Conjunctivitis	1.7					
370	Refractive errors	6.0					1.9
373	Strabismus	2.2					
374	Cataract				3.3	9.4	
375	Glaucoma					5.1	
377 ¹⁾	Other diseases of retina and optic nerve					4.2	
380	Otitis externa	1.8	1.5				
381 ²⁾	Otitis media without mention of mastoiditis	14.3	1.6		2.8		4.2
384	Other inflammatory diseases of ear	12.0	1.6				3.4
389	Other deafness			2.0	5.6	11.7	2.4
401 ³⁾	Essential benign hypertension			9.0	21.3	20.5	6.7
412 ⁴⁾	Chronic ischaemic heart disease			1.8	3.9	5.4	
413	Angina pectoris					3.2	
427	Symptomatic heart disease				5.5	12.7	1.9
438 ⁵⁾	Cerebrovascular disease				3.8	3.2	
461	Acute sinusitis		2.1				
463	Acute tonsillitis	4.9	2.6				2.0
465 ⁶⁾	Acute upper respiratory infection	6.9	3.6	2.0			3.4
500	Hypertrophy of tonsils and adenoids	2.2					
629 ⁷⁾	Other diseases of female genital organs		1.9				
713 ⁸⁾	Osteo-arthritis			3.5	8.1	7.9	2.5
717 ⁹⁾	Other non-articular rheumatism		1.9	2.4			
728 ¹⁰⁾	Vertebrogenic pain syndrome		2.9	4.4			2.5
731	Synovitis, bursitis, and tenosynovitis		1.8	2.3			
785 ¹¹⁾	Symptoms referable to lower gastrointestinal tract		1.5				
787	Symptoms referable to limbs and joints		1.3				
	Other diagnoses	62.1	79.9	93.6	131.7	135.2	99.9
	Total	121.4	108.3	133.4	199.6	233.1	137.6

Remarks: according to code list for diagnoses in ambulatory care (36),

- 1) Classified as nr 378
- 2) Excluding 381.9
- 3) Including 402-404
- 4) Including 411, 414
- 5) Including 430-437
- 6) Including 460, 462
- 7) Including 612, 613, 615-622.0, 624-625, 626.1-.2, 626.4-.7
- 8) Excluding 713.2
- 9) Excluding 717.2
- 10) Excluding 728.1, 728.3-.4, 728.6-.7, 728.9
- 11) Excluding 785.0, 785.6, 785.8

Discussion

Information about numbers of outpatient visits for various diagnoses, as with inpatient care episodes and care-days, can be useful in the planning of health care activities. However, such outpatient data have not been widely used, to date, largely because they have not been adequately registered. The number of outpatient visits for various diagnoses may reflect the disease panorama of the population, but as in the case of inpatient care, results are influenced by variations in clinical routine. This may cause distortions to appear, when comparing the experience of various population groups, and individual-related material is required in order to overcome this problem.

Consumption of services in inpatient care

Care episodes per 1,000 residents

Between 1970 and 1979, the total number of care episodes among Malmöhus County residents increased from 51,911 to 65,143, representing an absolute rise of 25 percent, or an 11-percent rise in the rate per 1,000 residents.

Comparable data are available for the nation from 1977 (53). For all age groups, 15 years and older, discharge frequencies were lower in the Malmöhus County population than in the country at large (Table XVI).

Table XVI. Number of care episodes (excluding deliveries) per 1,000 residents by age group, Malmöhus County (1970-1979) and the nation (1977).

Age Group	Malmöhus County										Sweden 1977
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	
0-14	97	105	106	101	96	95	94	89	88	89	87
15-44	81	85	84	80	80	77	83	84	75	74	89
45-64	121	122	125	126	124	124	130	137	143	140	145
65-74	192	194	203	217	217	220	236	239	255	247	249
75+	278	288	307	349	357	349	391	406	421	404	414
Total	115	119	122	123	122	120	128	130	130	128	136

During the 10-year period, a decreasing episode rate per 1,000 residents was observed in the age group under 45 years, while all other age groups showed an increase (Table XVII).

Table XVII. Average numbers of care episodes per year and 1,000 residents, by age group, Malmöhus County, 1970-1979.

Age Group	Number	Coefficient of Regression	Correlation Coefficient
0-14	96	- 1.8	- 0.85
15-44	80	- 0.8	- 0.60
45-64	129	2.4	0.90
65-74	222	7.0	0.97
75+	355	16.2	0.96
Total	124	1.5	0.89

Distribution by medical district

With certain exceptions, the proportion of care episodes during the period 1969-1978 remained stable among the various district hospitals, in relation to population. The pattern for 1978 is shown in Table XVIII. During this period, the population of Helsingborg Medical District showed an increased proportion of care episodes taking place at Helsingborg District Hospital (from 87 percent in 1969 to 90 percent in 1978). The population of Landskrona showed an increase from 4 to 10 percent, in the proportion of episodes taking place at Helsingborg District Hospital. In the middle of the period, there occurred a redistribution of episodes from Landskrona to Lund, which then took charge of 46 percent of care episodes among the Landskrona population. At the end of the period, however, the distribution pattern returned to that seen at the beginning.

During the same period, the population of Trelleborg Medical District showed an increase from 52 to 60 percent of care episodes being handled within the district, while the pattern in Ystad Medical District remained stable.

Table XVIII. Percent distribution of care episodes by hospital, for residents of various medical districts in Malmöhus County, 1978.

Hospital	Medical District					
	Helsingborg	Landskrona	Lund	Trelleborg	Ystad	Örup
Helsingborg	89	10	-	-	-	-
Landskrona	-	62	-	-	-	-
Lund	10	27	98	39	27	93
Trelleborg	-	-	-	60	-	-
Ystad	-	-	-	-	72	-
Örup	1	1	1	1	1	6
Total	100	100	99	100	100	99

Discussion

Information about numbers of care episodes and care-days for defined population groups can be useful in the dimensioning of health care resources, since the size and structure of the population groups can effectively contribute to the planning process. In order to accurately reflect the organizational characteristics of the health services, data should also identify the care units, at which contacts have occurred. This provides a basis for the dimensioning of resources at the various units, but is also an instrument in the follow-up study of changes in the distribution of resources.

Consumption of services in outpatient care

Visits per inhabitant

The total number of visits to public medical facilities in Malmöhus County, 1979, was 1,181,878. Of these, 40,640 were visits by nonresident patients. The number of visits to private practitioners within the county was 194,947. For the county population, the total number of visits, excluding out-of-county visits, was therefore 1,336,185.

The number of visits per inhabitant was 2.63, including 2.25 visits to public facilities and 0.38 to private practitioners. The number varied according to age and sex, women making more visits than men, and older residents more than younger (Table XIX).

Table XIX. Number of outpatient visits per inhabitant, according to sex and age group, for different types of medical service, Malmöhus County, 1979.

Age Group	Hospital and Psychiatric Services			Non-hospital Services			Total		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
0-14	1.16	0.97	1.07	0.87	0.84	0.86	2.03	1.81	1.92
15-44	1.00	1.33	1.16	0.83	1.08	0.95	1.83	2.41	2.12
45-64	1.35	1.46	1.41	0.81	1.02	0.92	2.16	2.49	2.32
65-74	1.71	1.50	1.60	1.13	1.28	1.21	2.84	2.78	2.81
75+	1.94	1.56	1.71	1.41	1.40	1.40	3.35	2.95	3.10
Total	1.22	1.32	1.27	0.89	1.06	0.98	2.11	2.38	2.25

In the age group 15-44 years, women made 32 percent more visits per inhabitant than did men. In the age group 45-64 years, this difference was 15 percent. In other age groups, males made more visits than females: 12 percent more in the age group 0-14 years, and 14 percent more in the group 75 years and older.

With the exception of males in the younger age groups (0-14 and 15-44 years), the number of visits per inhabitant increased with age.

The proportion of visits made to hospital and psychiatric units was 58 percent for men and 55 percent for women, the proportion for men being consistently higher than for women, except in the age group 15-44 years.

Distribution by commune

The number of outpatient visits per inhabitant is shown by commune in Table XX. The material was sorted by type of care and was also corrected for losses and discrepancies between commune and postal-code boundaries.

Table XX. Number of visits per inhabitant by commune and type of care unit, Malmöhus County, 1979.

Commune	Non-hospital Service	Hospital and Psychiatric Services	Total
Bjuv	1.18	0.94	2.12
Helsingborg	0.84	1.23	2.07
Höganäs	0.99	0.88	1.87
Landskrona	0.98	1.35	2.33
Svalöv	1.36	1.09	2.45
Burlöv	1.01	1.27	2.28
Kävlinge	1.06	1.31	2.37
Lomma	1.12	1.05	2.17
Lund	0.73	1.85	2.58
Staffanstorps	0.78	0.92	1.70
Eslöv	1.34	1.34	2.68
Hörby	1.28	0.88	2.16
Höör	1.52	1.03	2.55
Svedala	1.03	1.04	2.07
Trelleborg	0.96	1.52	2.48
Vellinge	0.68	0.95	1.63
Sjöbo	1.24	0.83	2.07
Skurup	1.56	0.96	2.52
Ystad	0.83	1.26	2.09
Total	0.97	1.27	2.24

Non-hospital services were more comprehensive in communes without a hospital. This is also reflected in the data, where the populations of such communes are generally shown to have made more visits to non-hospital than to hospital facilities.

Discussion

Information about outpatient visits among defined population groups can be useful in the dimensioning of resources, and are especially important in follow-up studies of the effects of structural changes in the health service organization, for example in the shift of emphasis from hospital to non-hospital services. Since information from the statistical systems is used as a basis for the dimensioning of services, it should be noticed that postal code and other administrative boundaries do not entirely agree. In the present study, correction is made for discrepancies between postal code area and commune.

If registration is linked to the population register, the possibility then arises for alternative geographical divisions. Dependency upon administrative boundaries can be avoided altogether by applying a system of coordinates. Population data within the county have been processed against

the system of property coordinates and work is under way to investigate the possibilities of linkage with these registers. Such efforts have already been made in Tierp (54).

Information about outpatient visits, as a basis for dimensioning of resources, should be used in combination with other data, such as time per visit. In the description of goals for outpatient services in Malmöhus County, it is claimed that an improved quality of care can be achieved through increased amount of time per visit, thereby affecting the number of visits. Since the non-hospital services are currently undergoing a period of expansion, in which some geographical areas are more affected than others, certain geographical variations may be expected in studies of regional differences in numbers of visits. In one study, the attempt was made to meet this problem by correlating the amount of available working hours in the non-hospital services with changes in numbers of visits to hospitals (55). A definite relationship was found between increased working hours in the non-hospital services and reduced numbers of visits at hospitals.

A comparison with other regions shows that the number of visits per inhabitant in the country at large is in agreement with the material from Malmöhus County. For the entire country, the total number of outpatient visits per inhabitant, in 1978, was 2.59, of which 2.21 occurred at public care units (56).

In Tierp, the number of visits was registered during 2 months of 1973 (57). Estimates for the entire year, based upon this material, are shown in Table XXI. Figures for Dalby, 1979, are also included in the table (10).

Table XXI. Number of visits per inhabitant, by age group, to public medical services in Tierp, 1973, in Dalby, 1979, and in Malmöhus County, 1979.

Age Group	Tierp	Dalby	Malmöhus County
0-14	1.70	1.76	1.92
15-44	2.16	1.96	2.12
45-64	2.69	2.54	2.32
65-74	2.90	2.95	2.81
75+	2.82	3.41	3.10
Total	2.34	2.12	2.25

The proportion of non-hospital visits was 44 percent in Malmöhus County. This was higher than in the country at large. In the entire country, during 1978, 36 percent of all visits to the public health services were to general practitioners (56). In Tierp during 1973 the corresponding proportion was 44 percent (57).

In 1975, an interview-based study (17) showed that about 25 percent more of the interviewed women, compared with the men, had consulted doctors

during a 3-month period. The proportion reporting medical consultations was greater with increasing age. Interview data in 1975 and 1977 (personal communication, 1981) were analyzed for the proportion of respondents reporting medical visits for illness during a 3-month period. After standardization for age, Malmöhus County showed a 3 percent lower figure than the national average. Of those respondents having regular contacts with a doctor, the proportion referring to private practitioners was 40 percent in Malmöhus County, compared with 27 percent in the nation. These figures indicate that the population of Malmöhus County is making visits to private practitioners in Malmö as well. No studies are available of the extent of such visits.

Visits per individual

As shown in Table XX, the population of Skurup Kommun had, in 1979, the highest proportion of visits to non-hospital facilities among all communes within the County Council's jurisdiction. In this study, consumption of medical services by this population were therefore analyzed in greater detail, partly to determine the number of persons who visited doctors, and partly to determine the distribution of visits per individual. Adjustment was not made for discrepancies between postal-code and communal boundaries, which implies that the number of persons visiting a doctor was actually somewhat higher than shown in these results.

Total number of patients

Of the entire population 72 percent made one or more outpatient visits during 1979. The distribution by number of visits is shown in Table XXII.

Table XXII. Cumulative proportion of population in Skurup Commune, according to number of outpatient visits per individual in 1979.

Visits per Individual	Males	Females	Total
11+	2	3	2
6-10	9	11	10
5	13	16	14
4	18	23	21
3	27	34	30
2	41	49	45
1	68	76	72

Distribution of patients at various medical facilities

Of the entire population of Skurup, 53 percent visited the medical center in Skurup at some time during 1979. Of these, about 4 out of 10 had other contacts, as well. A further 19 percent of the population had contacts only with some other facility. The proportion of the population with outpatient visits at the medical center and at hospital are shown in Table XXIII.

Table XXIII. Proportion of population in Skurups Commune making visits to the Medical Center and hospital during 1979.

Visits per Individual At Medical Center	At Hospital*					Total
	0	1-2	3-5	6-9	10+	
0	27.9	13.6	3.9	1.0	0.5	47.0
1-2	24.7	8.6	2.8	0.8	0.2	37.1
3-5	6.4	4.0	1.7	0.4	0.2	12.7
6-9	1.1	0.7	0.3	0.3	0.1	2.5
10+	0.2	0.2	0.1	0.2	0.0	0.7
Total	60.2	27.2	8.9	2.7	1.0	100.0

* Including visits to non-hospital emergency units in Ystad and Lund, as well as non-hospital services in Ystad.

Discussion

Information about numbers of outpatient visits per individual can provide a basis for screening or self-care programs. With such material, it is possible to calculate the proportion of the population making visits to various medical facilities during a given time period. In the present study it was found that 72 percent of the Skurup population made at least one outpatient visit during a one-year period. Corresponding proportions for the Dalby population were 56 percent during a one-year period in 1973/74 (58) and 67 percent in 1979 (10).

Malignant neoplasm of breast

Incidence

During the 10-year period 1970-1979, the total number of care episodes involving malignant neoplasms of the breast (ICD 174) was 7,282, for residents of Malmöhus County. In 1970 there were 414 episodes, but by 1977 the number had risen to 1,190. This reflected the fact that patients were increasingly being treated in distinct episodes of one day, each.

The number of newly registered patients increased from 221 in 1975 to 259 in 1979. Their distribution by age groups is shown in Table XXIV.

Table XXIV. Number of new cases of breast cancer and mean annual incidence per 100,000 women, by age group, Malmöhus County, 1975-1979.

Age Group	Year 1975	1976	1977	1978	1979	1975-1979	Incidence
-29	-	3	1	2	1	7	1.4
30-34	3	3	3	3	5	17	19.9
35-39	6	4	9	10	13	42	49.7
40-44	10	17	15	10	10	62	89.9
45-49	16	19	25	24	20	104	153.2
50-54	24	25	27	26	14	116	166.6
55-59	17	19	21	18	27	102	144.0
60-64	33	37	39	28	32	169	250.8
65-69	36	33	38	29	36	172	259.1
70-74	28	32	34	28	32	154	262.4
75-79	18	25	32	26	27	128	289.4
80-84	14	16	20	23	24	97	340.1
85+	16	19	21	14	18	88	435.2
Total	221	252	285	241	259	1,258	99.0

In 1975 the number of new cases per 100,000 women was 88.2. Using an age-standardized population, the annual rates for 1976-1979 were 99.5, 111.2, 92.9, and 98.1, respectively.

The distribution of new cases according to residence commune is shown in Table XXV. At the chosen significance level, $p = 0.035$, no commune was found to deviate significantly from expected rates, after standardization on age.

Table XXV. Age-standardized ratios for new cases of breast cancer, and "p-value", by commune, Malmöhus County, 1975-1979.

Commune	Ratio	p-value
Bjuv	0.94	0.727
Helsingborg	1.04	0.483
Höganäs	0.90	0.445
Landskrona	0.94	0.566
Svalöv	0.65	0.045
Burlöv	0.80	0.287
Kävlinge	1.12	0.458
Lomma	0.91	0.624
Lund+Staffanstorp	1.15	0.035
Eslöv	1.08	0.516
Hörby	0.96	0.809
Höör	0.88	0.520
Svedala	1.11	0.580
Trelleborg	1.05	0.666
Vellinge	0.87	0.436
Sjöbo	1.00	0.978
Skurup	1.00	0.984
Ystad	0.77	0.053

Duration

First year of registration is shown in Table XXVI for patients who received care in 1979. Registration during an intervening year is also indicated.

Table XXVI. First year of registration for patients with breast cancer and treated during 1979, Malmöhus County.

First Year Registered	Not registered during intervening years	Also registered during intervening year
1970	3	2*
1971	3	3*
1972	1	4*
1973	3	12
1974	7	8
1975	6	11
1976	15	15
1977	22	9
1978	49	-
1979	259	-
Total	368	64

* All registered during the period 1974-1978.

In this study, incidence was calculated by first screening out all patients registered prior to the current year. This disclosed that of all 432 patients who were treated during 1979, 173 had also been treated at some other time during the period 1970-1978. If only a 5-year period (1974-1978) had been considered prior to the current year, then incidence would have been over-estimated by about 4 percent (10 cases of 259). Some additional over-estimation of true incidence also results from the fact that some patients registered as new cases in 1979 may have received care before 1970 but not during the interval 1970-1978.

Number of illness-years has been calculated for patients first registered in 1975, by reference to year in which last registered (Table XXVII).

Table XXVII. Number of new cases of breast cancer from Malmöhus County, 1975, by year of last registration.

Year of Last Registration	Number of Patients	Number of Illness-years
1975	143	143
1976	22	44
1977	18	54
1978	21	84
1979	17	85
Total	221	410

The average number of illness-years per patient was 1.9. In the preceding table, it is seen that the registration period was too short: that the real duration of illness was longer.

Prevalence

Prevalence of the disease in 1975 was calculated by adding together those patients treated in 1975 (363 cases) and those treated both before and after, but not during, 1975 (149 cases), yielding a total of 512 patients during 1975. Since the number of new cases in that year was 221, prevalence was 2.32 times greater. This ratio, taken together with the above estimated duration, provides a basis for the estimation of prevalence based on incidence for the period 1976-1979, as well (59).

Discussion

Breast cancer is the most common form of cancer in Swedish women. During 1978 it accounted for 1/4 of all new cases of malignant neoplastic disease among women in Sweden (43).

Breast cancer occurs, frequently, over a long period of time. It is therefore difficult to define the time of onset. At the Regional Tumor Registry onset is defined in the following manner. The patient must have developed the disease in Sweden and not before the start of registration, and the patient must be found in the population register. The patient is assigned to the place of residence obtaining at the time of onset. Multiple cancers are regarded as separate cases, while metastases are not defined as new cases.

Corresponding definitions in the statistical systems cannot be achieved in practice, for two reasons. The systems are not linked to other registers outside the region, which means that a patient on moving to a new area is regarded as a new case, even though she may have developed the disease earlier. Furthermore, there are practical difficulties in linking the records of medical contacts over very long periods.

This problem could be solved, theoretically, by introducing a special coding procedure for first-time cases. In order to enhance the reliability in the material, subsequent contacts should be marked to indicate the year of last preceding contact. This procedure is also applicable for diseases other than breast cancer, but of similar pattern, such that treatment may be continued over a long period and recidivism may occur.

Health planning that attempts to identify the causes of disease, requires information about onset as a foundation. Statistical systems, in their present form, can be used to obtain a general picture. Comparisons with information in the tumor register show that the material is sufficiently reliable to provide a description of the age distribution. Special studies of the tumor register also corroborate the geographical information in the statistical systems. Trends over time can also be studied, provided that the processed material covers a sufficiently long period (at least 5 years).

Prevalence is often a sufficient basis for health-care planning. On condition that the patient maintains regular contacts with the health services until free of complaint, the present statistical systems should be usable in this respect. They can also be used as a complement to other registers, in this case a tumor register, with data on consumption of services.

As previously mentioned, the number of registered breast-cancer patients was 363 in 1975 and 432 in 1979. Annual frequencies during 1976-1978 were 387, 453, and 411, respectively. When incidence is compared with these frequencies, it is seen that incidence accounted for 60 to 65 percent of the number treated during a given year. Approximation of the number of new cases, using information about the number treated during a given year, is an over-simplification. However, since exact quantities are not always for necessary planning purposes, such calculations can be useful as broad indicators.

Diabetes mellitus

Regional differences

The total number of care episodes due to diabetes (ICD 250) during the period 1975-1979, was 16,538 for the population of Malmöhus County. The total number of patients was 6,621, of whom 3,127 were men and 3,494 were women.

Standardized ratios representing the distribution of diabetes cases by commune, are shown in Table XXVIII. Using the significance level, $p = 0.065$, higher than expected ratios were found in the Landskrona and Trelleborg populations, while lower than expected ratios were found in Lund-Staffanstorp, Lomma, Eslöv, Hörby, and Höör, after standardization on the age and sex distributions in the respective populations.

Table XXVIII. Age- and sex-standardized ratios for diabetes mellitus and "p-value", by commune, Malmöhus County, 1975-1979.

Commune	Ratio	p-value
Bjuv	1.12	0.116
Helsingborg	1.03	0.229
Höganäs	0.96	0.485
Landskrona	1.22	1.0×10^{-6}
Svalöv	1.08	0.288
Burlöv	1.05	0.513
Kävlinge	0.87	0.065
Lomma	0.80	0.013
Lund+Staffanstorp	0.88	1.0×10^{-4}
Eslöv	0.89	0.027
Hörby	0.84	0.021
Höör	0.84	0.034
Svedala	1.01	0.934
Trelleborg	1.18	1.0×10^{-4}
Vellinge	1.04	0.533
Sjöbo	0.95	0.482
Skurup	0.94	0.424
Ystad	1.05	0.285

Corresponding tests were carried out for men and women, separately. For men, the p-value was set to 0.045, giving higher than expected ratios for men in Landskrona ($p = 0.011$) and Trelleborg ($p = 0.005$), and lower than expected in Kävlinge ($p = 0.017$), Eslöv ($p = 0.009$), and Hörby ($p = 0.026$). For women the p-value was set to 0.048, giving higher than expected ratios in Landskrona ($p = 1.0 \times 10^{-5}$) and Trelleborg ($p = 0.004$), and lower than expected values in Lund-Staffanstorp ($p = 1.0 \times 10^{-5}$).

In order to investigate whether differences in the number of reported diabetes patients might be dependent upon general variations in frequencies of admissions for all causes, or upon differing criteria for admission with diabetes at different hospitals, the relationship between these parameters was analyzed by commune (Table XXIX).

Table XXIX. Diabetes patients, care episodes for all causes, and care episodes with diabetes as primary diagnosis, by commune, Malmöhus County, 1975-1979.

Commune*	Diabetes Patients per 100 Inhabitants	Care Episodes per Inhabitant, all diagnoses	Care Episodes per 100 Inhabitants, Diabetes
Bjuv	1.49	0.62	0.98
Helsingborg	1.36	0.71	1.03
Höganäs	1.26	0.57	0.84
Landskrona	1.60	0.70	1.52
Svalöv	1.41	0.59	1.12
Burlöv	1.37	0.67	1.25
Kävlinge	1.16	0.65	1.35
Lomma	1.11	0.56	0.93
Lund+Staffanstorp	1.16	0.66	1.06
Eslöv	1.17	0.62	1.12
Hörby	1.10	0.56	0.95
Höör	1.07	0.58	0.78
Svedala	1.31	0.55	1.26
Trelleborg	1.56	0.61	1.25
Vellinge	1.40	0.54	1.02
Sjöbo	1.29	0.59	1.34
Skurup	1.25	0.57	0.80
Ystad	1.41	0.65	1.43
Total	1.31	0.64	1.12

* Standardized on age distribution in population of Malmöhus County, December 31, 1977.

The coefficient of correlation between diabetic patients and care episodes for all causes was 0.36 ($p > 0.05$), implying that the varying admission frequencies among hospitals did not explain the differences found in numbers of diabetic patients. The coefficient of correlation between diabetic patients and care episodes due to diabetes was 0.52 ($0.01 < p < 0.05$), which implied that criteria for admission of diabetes patients were related to the number of diabetes patients found. Differences in numbers of diabetes patients can therefore be partially explained by differences in criteria for admission.

Prevalence

Diabetes patients appearing in the population register for Ystad as of January 27, 1982, were also found in the following registers. In PAS (outpatient), 505 persons were found, compared with 297 in PAS (inpatient). Of these, 209 persons appeared in both registers, leading to an unduplicated total of 593. Their distribution by sex and age is shown in Table XXX.

Table XXX. Number of diabetes patients per 100 inhabitants, by sex and age group, Ystad Commune, January 27, 1982.

Age Group	Male	Female	Total
0-14	0.3	0.1	0.2
15-44	0.9	0.7	0.8
45-64	3.3	1.9	2.6
65-69	5.6	6.4	6.1
70-74	7.9	6.6	7.2
75-79	8.1	6.4	7.1
80-84	9.6	8.9	9.1
85+	8.8	5.4	6.5
Total	2.6	2.4	2.5

After standardization on the age and sex distribution of the population of Malmöhus County on December 31, 1981, the total prevalence was found to be 2.0 percent. After standardization on age, the prevalence for men was 2.2 percent and for women, 1.9 percent.

Discussion

Information from PAS (inpatient) was used in the present study to investigate regional differences of diabetic patients. In spite of the registrations having included all admissions for diabetes (as primary or secondary diagnosis) during a 5-year period, not all cases of diabetes are identified. It is therefore necessary to determine the extent to which geographical differences in numbers of patients found are explained by differences in procedures or by differences in criteria for admission as inpatients, in the various communes.

Tests in this study indicate that such influences may exist. Material from PAS (inpatient) can, none-the-less, provide some indication in studies of regional differences, but verification should be sought in further studies.

Fewer diabetic patients are treated as inpatients in Malmöhus County than in the country as a whole. In 1975, 21 percent of diabetic patients from Tierp were treated as inpatients (60). The proportion of diabetic patients for Tierp would then be 0.48 percent, after standardization on the age and sex distributions of the Malmöhus County population. The corresponding figure for Malmöhus County in the same year was 0.33 percent. According to one study of inpatient discharges during 1977, the population of Uppsala County, where Tierp is situated, had 348 discharges per 100,000 inhabitants, with diabetes as primary diagnosis, after standardization on the age characteristics of the Malmöhus County population (53). The corresponding figure for Malmöhus County was 223, an impressive difference.

In comparison with still other counties, and with the national average, Malmöhus County reports fewer inpatients with diabetes as primary diagnosis (19).

For the purpose of estimating the prevalence of diabetes mellitus, an adequate material is available from the combined registrations in PAS (inpatient) and PAS (outpatient). In Ystad Commune, 2.5 percent of the population were registered for diabetes. A certain loss occurs due to patients admitted under other types of services. On the basis of various studies, it has been calculated that the prevalence of diabetes in Sweden, 1965, was 2.05 percent of the entire population (61). In Tierp, 1975, the prevalence was found to be 2.3 percent after standardization on the age and sex distributions of the population of Malmöhus County (60). That figure can be compared with 2.0 percent for Ystad, after standardization.

The distribution by sex shows a higher prevalence in men of all age groups except for 65- to 69-year-olds. Other studies have found a higher prevalence for women than for men (61). In Tierp, this was true for the age groups 65-74 years, and 75 years and over (60).

One explanation for the lower prevalence among older women in Ystad, is seen when the material is checked against the population register. Deceased persons, still carried as current in the patient registers, can thereby be excluded. In Ystad, 7 men and 14 women were excluded when it was found that they were still carried in the statistical system for 1981, although not present in the population register of January 27, 1982. In the age group, 75 years and older, 75 men and 92 women are included in the calculations, which shows that the effect of the correction was greater for women than for men. This may depend upon different age distributions between men and women, but it may also be due to a higher mortality risk for women than for men, in association with diabetes mellitus.

Another interpretation of the results from Ystad would be that female diabetics remain undetected to a greater extent than males.

The calculation of incidence can be facilitated by the use of information in medical records about time of onset of disease. For this disease, however, the necessary information can be most easily obtained from specially constructed registers, similar to the tumor register, which also can contain additional medical data.

In general, the analysis shows that PAS (inpatient) does not provide an adequate basis for the estimation of prevalence in this disease. Regional variations can be estimated if treatment routines and criteria for admission are uniform among the various units. Supplemental information about outpatients provides an acceptable basis for the calculation of prevalence. Incidence can be investigated using such material as a starting point, if supplemented by studies of the medical records, but since this must be carried out retrospectively, it is more difficult to estimate the incidence in a defined population. For this reason, incidence should instead be calculated with the help of supplemental information in the statistical systems or through specialized registers.

This analysis emphasizes especially the importance of being able to link the data in the systems to the population register.

Otitis media without mention of mastoiditis

Incidence

In the population of Ystad Medical District, during the period from April 1, 1981 to March 31, 1982, a total of 2,717 visits were reported with otitis media (ICD 381) as primary diagnosis.

The number of illness episodes was 1,901, of which 1,522 occurred in the age group under 20 years. Of the latter, 796 occurred in males and 726 in females. The total number of persons with otitis media, under 20 years of age, was 1,276, of whom 656 were males and 620 were females. In the population under 20 years of age, 9.7 percent were registered with otitis media.

The number of illness episodes per 100 inhabitants under 20 years of age is shown in Table XXXI.

Table XXXI. Number of illness episodes of otitis media per 100 inhabitants, by sex and age group, Ystad Medical District, April 1, 1981 to March 31, 1982.

Age	Males	Females	Total
0	25.7	15.3	20.3
1	38.8	28.0	33.5
2	25.7	24.7	25.2
3	24.1	32.5	28.1
4	25.1	22.4	23.8
5-9	14.0	13.8	13.9
10-14	6.1	6.5	6.3
15-19	2.1	2.4	2.3
Total	11.7	11.4	11.5

Discussion

In this study, return visits were linked to previous visits, regardless of elapsed time interval, when defining illness episode of otitis media. No suitable time limit could be selected, because procedures regarding return visits were variable, not only between doctors but between times of year. Return visit is defined in PAS (outpatient) as a visit to the same unit for the same disease within an 18-month period. In otitis media it is therefore impossible to distinguish between this definition and the onset of a new inflammation. This analysis leads, therefore, to an under-estimation of incidence. At the same time, some over-estimation may occur when a case regarded as new at one unit may actually be an inflammation, which has been previously treated at another unit. The magnitude of these errors can be calculated by following up this material with studies of the medical records.

Another reason for the possible under-estimation of the incidence in this material is that not all visits for otitis media are included, since the emergency center in Ystad does not register diagnosis. This illustrates the importance of complete registration for the entire population group, in this illness, if the material is to be used in calculating incidence.

Most previous, epidemiological studies of the incidence of acute otitis media have been carried out in small, isolated communities (for a general review, see 62, 63). A larger investigation has been recently published, however, from Malmö (62), in which the number of episodes with acute otitis media during 1980 is reported as 12.3 per 100 inhabitants in the age group 0-15 years. The rate in Ystad was 14.6 in the age group 0-14 years.

Various studies of otitis media are at mutual variance regarding both design and methods of diagnosis. It can be concluded, however, that the disease is most common during the first 2 years of life and continues to be common until beyond the pre-school age, and that it occurs more frequently in boys than in girls.

In summary, this study has shown that PAS (outpatient) can be used in the investigation of incidence of otitis media. In order to increase the reliability of calculations, procedures are needed for the separation of follow-up visits from other kinds of visits.

Acute myocardial infarction

Incidence

For male residents of Malmöhus County during the period 1975-1979, the total number of discharges and care episodes with acute myocardial infarction (ICD 410) as primary diagnosis, is shown in Table XXXII.

Table XXXII. Number of discharges and care episodes involving acute myocardial infarction, in males, Malmöhus County, 1975-1979.

Year	Discharges	Care Episodes
1975	1,340	1,049
1976	1,518	1,167
1977	1,418	1,123
1978	1,613	1,250
1979	1,542	1,185
Total	7,431	5,774

The number of care episodes constituted 78 percent of the number of discharges. The number of new cases was fewer than the number of care episodes, or 83 percent for the period 1976-1979.

For each year, the number of new cases was distributed by age. The distribution for the entire 4-year period, and mean annual incidence are shown in Table XXXIII.

Table XXXIII. Number of new cases of acute myocardial infarction, and mean annual incidence per 100,000 residents, by age group and sex, Malmöhus County, 1976-1979.

Age Group	Males		Females	
	New cases	Incidence	New cases	Incidence
-29	4	0.9	2	0.5
30-34	10	11.2	2	2.3
35-39	23	31.2	6	8.7
40-44	59	101.1	9	16.1
45-49	108	199.2	19	35.1
50-54	231	421.5	49	88.5
55-59	441	786.3	77	134.7
60-64	510	1,026.7	144	268.5
65-69	678	1,422.3	251	472.7
70-74	703	1,853.1	415	874.7
75-79	595	2,339.2	428	1,190.3
80-84	331	2,351.7	356	1,540.0
85+	231	2,704.6	299	1,822.3
Total	3,924	393.8	2,057	201.5

Annual incidence rates for males and females were calculated for the period, 1976-1979 (Table XXXIV).

Table XXXIV. Number of new cases of acute myocardial infarction and annual incidence rates per 100,000 residents, by sex, Malmöhus County, 1976-1979.

Year	Males			Females		
	New cases	Incidence Total	Age adjusted	New cases	Incidence Total	Age-adjusted
1976	985	398.5	398.5	508	201.3	201.3
1977	919	369.3	367.8	514	201.7	199.3
1978	1,061	424.7	421.5	519	202.6	199.8
1979	959	382.6	377.5	516	200.5	193.9

Incidence for men was higher in 1978 than in other years. For women there was no corresponding deviation. The difference between total and age-adjusted incidence rates is explained by shifts in the age structure toward a greater proportion of older persons.

The distribution of new cases, among communes within the county, was studied for the period 1976-1979 (Table XXXV). With the significance level (p-value) set at 0.056, higher than expected ratios (after adjustment for age and sex distributions in the population) were found in Landskrona, Burlöv, and Lund-Staffanstorps. Lower than expected values were found in Höganäs and Ystad.

Table XXXV. Age- and sex-standardized ratios for acute myocardial infarction and "p-value", by commune, Malmöhus County, 1976-1979.

Commune	Ratio	p-value
Bjuv	0.90	0.213
Helsingborg	0.96	0.129
Höganäs	0.79	1.0×10^{-4}
Landskrona	1.13	0.003
Svalöv	0.88	0.103
Burlöv	1.28	0.002
Kävlinge	1.14	0.056
Lomma	1.01	0.938
Lund+Staffanstorps	1.14	1.0×10^{-5}
Eslöv	1.02	0.757
Hörby	0.90	0.155
Höör	0.94	0.436
Svedala	0.92	0.382
Trelleborg	1.08	0.086
Vellinge	0.90	0.210
Sjöbo	0.91	0.169
Skurup	0.87	0.082
Ystad	0.89	0.027

Corresponding tests were carried out for men and women, respectively. For $p = 0.039$, it was found that men in Landskrona ($p = 0.002$), Burlöv ($p = 0.002$), and Lund-Staffanstorps ($p = 0.002$), had higher than expected ratios, while those in Höganäs ($p = 0.001$) had lower than expected. For women, setting $p = 0.045$, higher than expected ratios were found in Kävlinge ($p = 1.0 \times 10^{-4}$) and Lund-Staffanstorps ($p = 0.004$), while lower than expected ratios were found in Sjöbo ($p = 0.024$) and in Ystad ($p = 0.001$).

Relationship between diabetes mellitus and acute myocardial infarction

In Landskrona Commune, 648 diabetics and 554 new cases of acute myocardial infarction were identified. The relationship between these diseases was investigated (Table XXXVI).

Table XXXVI. Occurrence of diabetes and/or acute myocardial infarction among the population of Landskrona Commune, 1975-1979.

Acute myocardial infarction	Diabetes mellitus			Women			Both sexes		
	Men			Yes	No	Total	Yes	No	Total
Yes	42	333	375	40	139	179	82	472	554
No	249	18,076	18,325	317	18,654	18,971	566	36,730	37,296
Total	291	18,409	18,700	357	18,793	19,150	648	37,202	37,850

Significance was tested using chi-square. A statistically significant association ($p < 0.001$) between the two diseases was found in men, women, and both sexes combined. Numbers of new cases of acute myocardial infarction among diabetics and non-diabetics are shown in Table XXXVII.

Table XXXVII. Proportion (%) of diabetic and non-diabetic population with new acute myocardial infarctions, by age group, Landskrona Commune, 1976-1979.

Age Group	Diabetic population			Non-diabetic population		
	Men	Women	Both sexes	Men	Women	Both sexes
0-14	0	0	0	0	0	0
15-44	0	0	0	0.1	0	0.1
45-64	14.6	13.4	14.1	3.2	0.3	1.7
65-74	21.1	12.5	16.7	5.9	2.3	3.9
75+	13.7	12.0	12.6	9.9	5.9	7.4
Total	14.4	11.2	12.7	1.8	0.7	1.3

Differences in the proportion of men and women having both diabetes and acute myocardial infarction were reduced by standardization on age, since the proportion for women then rises to 12.6 percent.

Incidence of acute myocardial infarction was compared between the two populations (Table XXXVIII).

Table XXXVIII. Proportion (%) of diabetic and non-diabetic populations with new acute myocardial infarctions, by sex, Landskrona Commune, 1976-1979.

Population	Percent with acute myocardial infarction		
	Men	Women	Total
Diabetic	14.43	11.20	12.65
Non-diabetic	5.30*	3.27*	4.18**
Ratio	2.72	3.43	3.03

* Age adjusted to the diabetic population.

** Sex and age adjusted to the diabetic population.

New cases of acute myocardial infarction were three times as frequent in the diabetic population, compared with the non-diabetic. This difference was larger in women than in men.

The number of new cases of acute myocardial infarction from Landskrona was compared with the total number from Malmöhus County, after correction for the over-representation, that was theoretically a consequence of over-representation of diabetes in the commune. This had the

effect of changing the p-value for men from 0.002 to 0.006, and for the total population from 0.003 to 0.018. The statistical over-representation of diabetics, therefore, accounted for some, but not all, of the over-representation of patients with new acute myocardial infarctions.

Discussion

Acute myocardial infarction was one of the most common reasons for admission to hospital during the 1970's (Table VIII). There was a sharp rise during the period 1970-1979. This rise was due in part, however, to changes in the registration procedures. When the MIVA (Medical Intensive Ward) in Lund was assigned an independent cost-accounting identity, patients first admitted there, but subsequently transferred to other wards, were registered twice. Analyses which have been based upon discharges do not always, therefore, give a fair impression of the geographical or temporal variations of the occurrence of a disease.

In the present study, therefore, discharges considered as belonging to a single care episode have been linked, thereby making it possible to estimate the incidence of acute myocardial infarction.

The material does not cover all care episodes, since some acute infarctions do not lead to admission to hospital. Admission to hospital may have been considered unnecessary, or the patient may have died before admission could take place.

The principle for deciding whether or not a particular care episode should be regarded as a new illness episode, must take into account such limitations as may exist for the processing of the material. In this study, a care episode was regarded as representing a new illness episode, if the patient had not been treated with the same diagnosis during the present or preceding calendar year. This definition must be seen as a statistical average, that is not necessarily true for individual cases. A preferable solution would have been to decide upon some interval, 12 months for example, rather than calendar year, as the defining boundary for new illness episodes. This would be possible with the help of computer programs.

If each person were allowed to enter the calculations just once, then the indicated total incidence rates, for both men and women, would be reduced by 2.6 percent. Results of the statistical tests between communes would not have changed significantly.

It is generally thought that statistical tests, according to the accepted rules, should not be applied to dependent variables. In this context, it can be claimed that acute myocardial infarction is a symptom of the underlying disease, coronary sclerosis, and that a patient should therefore be counted not more than once in the calculation of incidence rates. But since one objective is to develop methods for the identification of indicators, other than the purely biomedical, in the etiology of disease, it is theoretically possible to define a time limit for deciding whether or not an infarction should be regarded as a new case. A suitably selected time limit would

assist in the identification of social and other indicators in the etiology of the disease.

It can also be claimed that in practice it is impossible to be free from dependency in the material. In the present example, the limitation of counting a patient just once is hardly an adequate remedy. According to this view, there are other kinds of dependency which can occur, for example, that many persons may be exposed to the same injurious risk. For other diseases, there may be genetic dependencies which express themselves in several related individuals.

In one study, care episodes with acute myocardial infarction as primary diagnosis, were linked for patients who had been treated for the same disease during the same year (19). Incidence rates obtained by this method for 15 other counties are compared in Table XXXIX with those developed in the present study for Malmöhus County, 1977.

Table XXXIX. Incidence of acute myocardial infarction per 1,000 residents in 15-county area and Malmöhus County, by age group, 1977.

Age Group	15-county area		Malmöhus County	
	Men	Women	Men	Women
45-64	6	1	6	1
65-74	14	6	15	7
75-84	19	11	21	13
85+	19	13	27	17

Incidence in Malmöhus County was somewhat higher than in the 15-county area, especially in the upper age groups. One explanation may be that secondary diagnoses were included in the material from Malmöhus but not from the 15-county area.

Incidence of acute myocardial infarction was studied in Gothenburg for the period 1968-1970 (64). In that study, well defined criteria were used for the identification of the disease. In the age group 40-64 years, standardized on the Malmöhus County age distribution, 1976-1979, the study reported a 1970 incidence rate for men of 497, compared with 105 for women, per 100,000 population. Corresponding values for Malmöhus County were 494 for men and 108 for women. These results are remarkably alike, but the time interval of 6 to 10 years between the two investigations should be noted, along with the difference that persons who died outside of hospital were not included in the Malmöhus County material, and that each individual case in the Gothenburg material was accepted only after verification of certain standardized diagnostic criteria.

Regardless of registration method, it is difficult to calculate a "true" incidence of acute myocardial infarction, since the disease presents so varied a clinical picture, and also since the treatment and autopsy procedures are so variable. Against this background, it would seem possible to utilize the information in the statistical systems for the calculation of

incidence, especially for purposes of comparison between time periods and population groups.

In register-based studies, such as this, it is usually possible to study the occurrence of the disease in all age groups. In many cases, of course, the disease occurs only in some part of the population: for acute myocardial infarction, primarily in the age group over 40 years. When expressing the total incidence in a population, it is important to clearly define which parts of the population are included in the calculations. Even though acute infarction is more common among the elderly, it is open to discussion, whether or not this group should be included in the material; accurate diagnosis may be more difficult to obtain for older persons, compared with the younger.

For this reason it can be advantageous when comparing communes, to limit the study population to certain age groups. This has been attempted, while at the same time taking into account those persons who died outside of hospital, for men in Landskrona. During the 4-year period, a total of 1,386 cases in the age group 15-64 years was registered for Malmöhus County. The number dying outside of hospital, at ages from 20 to 54 years, gives an adjustment factor of 1.19 (64). After correction for earlier admissions, this factor should be 1.15, at most, which leads to the assumption of approximately 1,600 new cases in Malmöhus County. In the same material for Landskrona, there were 164 new cases among men in the age group 15-64 years. The expected value for the commune is approximately 125, so that this commune remains over-represented, even if no patient had died outside of hospital.

It should be possible, at least for certain illnesses, to work out criteria for the selection of population groups to be included in the presentation of total incidence or prevalence. This would provide a better basis for comparison of results between different studies.

In this study, incidence could be calculated on the basis of patients admitted for inpatient care at a hospital at some time during the course of illness. There is no solid evidence of any significant differences between hospitals as to admission policy in cases of acute myocardial infarction. This is supported by the observation that the geographical comparisons showed different results for communes within the same medical district. Alternative explanations should therefore be sought, of the regional differences. Relationship with diabetes was investigated in Landskrona, but this did not explain the entire excess in that commune.

Acute myocardial infarction occurs with significantly greater frequency among diabetics than in the rest of the population. Methods of defining patients with respect to these diseases may still lead to errors of interpretation. One type of error arose because not all patients with infarction were brought to hospital. This could lead to an under-estimation of incidence, both total and among diabetics. Assuming that the proportion of infarction patients not coming to hospital was the same in the diabetic and non-diabetic populations, it would not then be misleading to compare the incidence of the disease in these two populations. The proportion of "silent" infarctions was probably greater among diabetics than in non-diabetics, so the association is further strengthened.

Not all diabetics have been traced (see p 75). Lost cases were probably without infarctions, on the assumption that their diabetes would otherwise have been identified and registered as a secondary diagnosis in connection with the infarction. On the other hand, some diabetic patients appear in the registered diabetes population only because they were identified in consequence of their infarction: patients with no care episode due to diabetes without a concurrent episode of infarction. In this category were 11 men and 17 women from Landskrona. In order to avoid this source of confounding errors (65), the calculations were adjusted as follows. The diabetic population, after these deletions, still retained 620 patients. Infarction was found in 54 cases (8.7 percent). The proportion for men was 11.1 percent, compared with 6.8 percent for women. The comparison of incidence ratios for acute myocardial infarction between the diabetic and non-diabetic populations is affected to the extent that the ratios become 2.22 for men, 2.35 for women, and 2.27 for both sexes, after new standardization on age and sex.

An excess of acute myocardial infarctions among diabetics, especially female diabetics, has been previously reported from Framingham (66). For the entire group of cardio-vascular diseases in the age group 45-74, there was an excess among diabetics of 2.15 for men and 2.79 for women, after standardization on age. These ratios cannot be directly compared with those reported above, since different age groups are included in the respective populations.

In conclusion, the study shows that the existing statistical systems provide a basis for the estimation of incidence and regional variations in acute myocardial infarction. The results presented here suggest a need for further studies, in which the reasons for the reported differences should be investigated.

This investigation has shown that further studies should be undertaken to determine which time interval between two care episodes should be used when setting limits for the definition of new illness episodes. Further, norms should be worked out for the choice of age intervals to be studied. In order to eliminate losses of information due to persons who die without having been admitted as inpatients, additional material is needed besides that processed in this register. It is also important that attempts be made to improve the precision of diagnosis, through the working out of diagnostic criteria.

Asthma

During an 8-month period, the population of Ystad Medical District had a total of 396 outpatient visits and 63 care episodes due to asthma (ICD 493), at units within the district.

These contacts were accounted for by 256 persons, in all, of whom 151 were males and 105 were females. Of these, 17 were seen as inpatients, only. All remaining patients had been seen either as outpatients, alone, or both as in- and outpatients. The distribution of patients per 100 inhabitants is shown in Table XL.

Table XL. Numbers of asthma patients per 100 inhabitants, by sex and age group, Ystad Medical District, April 1 to November 30, 1981.

Age Group	Patients per 100 inhabitants		
	Males	Females	Both sexes
0-14	0.7	0.4	0.6
15-44	0.2	0.3	0.2
45-64	0.7	0.5	0.6
65-74	1.0	0.5	0.8
75+	1.6	0.5	1.0
Total	0.6	0.4	0.5

The total prevalence of registered asthma was 0.5 percent. It was greater among men than women in total, and in all age groups except 15-44 years. Prevalence was lowest in the age group 15-44 years and highest in the group 75 years and older.

Discussion

In a study from Sidney (67), 1971-1976, asthma was restricted by definition to cases requiring treatment by a doctor or in hospital. The study included ages up to 17 years. The results showed that the cumulative prevalence during a one year period was higher for boys than for girls. For 10-year-old boys the prevalence was 2.6 percent and 1.2 percent for girls of the same age. At age 15, the corresponding values were 3.4 and 2.0 percent, respectively. Not included, were cases of asthma with concurrent bronchitis, for which prevalences were about 2 percent in boys and about 1 percent in girls.

The Sidney study reported higher prevalences than those found in the Ystad Medical District in the age groups in question. If the study in Ystad had been extended to reflect a one-year period, also including the winter months, then a greater number of persons with asthma would probably have been identified.

In order to estimate the prevalence of asthma, on the basis of the statistical systems, a longer time-period than one year is probably needed. If the time-period is extended, then the material should be related to the population register, so that population changes can be taken into account.

Rheumatoid arthritis

Prevalence

According to the register at the medical center in Skurup, there were 131 patients in need of treatment for rheumatoid arthritis (ICD 712) in Skurup Commune on October 12, 1980. An additional 9 patients were treated in Lund but did not appear in the register (Table XLI). Altogether 26 patients were found under specialist care.

Table XLI. Rheumatoid arthritic patients requiring care, by age group, in Skurup, October 12, 1980.

Age Group	Number	Percent of population		
		Total	Male	Female
15-44	12	0.2	0.2	0.2
45-64	61	2.3	2.1	2.5
65-74	35	2.8	1.8	3.8
75+	32	3.2	2.5	3.8
Total	140	1.1	0.9	1.4

During the second half of 1980, 10 rheumatoid arthritic patients were registered at the medical center in Sjöbo. An additional 64 patients from Sjöbo were treated at hospitals in Ystad and Lund. Altogether 67 patients were identified under specialist care.

Under specialist care, in other words, there were 2.5 times as many rheumatoid arthritic patients from Sjöbo as from Skurup. At the same time, there were nearly twice as many registered rheumatoid arthritic patients in Skurup as in Sjöbo. In order to better explain these figures, an investigation was made to find out whether the patients from Sjöbo were making greater use of the medical services than those from Skurup. Numbers of visits and care-days are therefore compared in Table XLII.

From this comparison it is clear that the number of visits per patient were relatively alike, while the treatment times were longer for patients from Skurup, compared with those from Sjöbo. On the whole, this gave no support to the contention that rheumatoid arthritic patients from Sjöbo were more seriously ill of their disease than those from Skurup.

Table XLII. Consumption of medical services by rheumatoid arthritis patients in Skurup and Sjöbo, 1979.

Care facility	Skurup Patients	Visits	Care-days	Sjöbo		
				Patients	Visits	Care-days
Medical clinic, Ystad	2*	2	17	13*	35	50
Orthopedic dept., Ystad	5*	6	48	4*	4	4
Rheumatological clinic, Lund	14	36	158	54**	140	176
Orthopedic clinic, Lund	6	11	45	7**	12	56
Total	26	55	268	67***	191	286

* 1 patient registered at both clinics.

** 6 patients registered at both clinics.

*** 4 patients registered in both Ystad and Lund.

The majority of patients under specialist care were treated at the rheumatological clinic in Lund. A study of the medical records disclosed that many patients from Sjöbo were undergoing a relatively quiescent stage of chronic rheumatoid arthritis, and had been returning to the clinic for check-ups for several years. According to a district physician who checked the records, most of these patients could have been cared for by a peripheral "rheumatism" of the type found in Skurup.

About 2/3 of the total rheumatoid arthritic population are suffering from a disease of sufficient severity to motivate their inclusion in the planning process (47). This group has been called the minimal population and comprises about 1 percent of the total population. The 140 registered patients in Skurup Commune constitute 1.1 percent of the total population, an apparently realistic figure, and if the distribution of rheumatoid arthritic patients by sex and age, as shown in Table XLI, is used as the basis for calculation, then the expected number of rheumatoid arthritic patients in Sjöbo Commune should be 181. A summary comparison is shown in Table XLIII, which clearly indicates the effect of the case-finding program in Skurup. Over half of the expected population with rheumatoid arthritis in Sjöbo was unknown at all types of medical facility.

Table XLIII. Number of persons with rheumatoid arthritis in Skurup and Sjöbo.

Medical facility	Skurup	Sjöbo
Medical Center	131	10
Hospital	9	64
Total	140	74
Expected number	140	181

Juvenile rheumatoid arthritis

A total of 85 patients in the age group 0-14 years, with juvenile rheumatoid arthritis, were found living in Malmöhus County during the period 1978-1981. All except one of these patients had visited some outpatient facility. Altogether 35 patients had been admitted to hospital. The prevalence for the entire age group, in relation to the underlying population was 0.6 per 1,000. Frequencies per 1,000 in the detailed age groups were 0.3 for 0-4 years, 0.7 for 5-9 years, and 1.1 for 10-14 years.

Discussion

Rheumatoid arthritis is one of the important disease groups affecting the non-hospital medical services (68). The Skurup model represents a new form of organization in non-hospital care. It is built upon team-work, cooperation with the social services and rheumatologist, case-finding

program and planned home-visits. In this study, it has been shown that decentralized health services can effectively reduce the workload of the specialist units, as far as the treatment of rheumatic patients is concerned. Without a case-finding program, there is also the risk that a large group of patients will remain unknown to the medical service units, in spite of their need for treatment.

A necessary condition for the analysis of the occurrence of this disease, is the maintenance of individual-based registers. At the medical center in Skurup this is done manually. As demonstrated for Sjöbo, a large proportion of rheumatoid patients remains unknown. It should therefore be possible to coordinate computer registration and the introduction of the case-finding program. This would facilitate an analysis of the effects of various organizational forms and procedures. Such effects should, for example, be measurable through later follow-up activities. The question should be discussed, as to the desirability of creating special registers for rheumatoid arthritis, since this would facilitate the estimation of incidence rates and provide access to further medical information.

Injuries due to motor-vehicle accidents

Incidence

The total number of care episodes due to injuries caused by motor-vehicle accidents (ICD E810-E823), for residents of Malmöhus County under 15 years of age, during a 10-year period, was 1,255. The number of care-days was 11,389. This was the equivalent of 117 care episodes and 1,064 care-days per 100,000 population and year, based upon the population as of December 31, 1974.

The total number of patients from Malmöhus County, during the 10-year period, was 1,082, of whom 225 were automobile passengers, 383 were cyclists, 335 were pedestrians, and 139 were of other categories.

The risk (cumulative incidence) at birth of being admitted to hospital, at some time during the first 15 years of life, for serious injuries resulting from a motor-vehicle accident, could be estimated on the basis of this material as 1.54 percent.

The majority of these patients received treatment during a single care episode. The average number of care episodes per patient was 1.16 for all categories, 1.17 for automobile passengers, 1.09 for cyclists, 1.25 for pedestrians, and 1.13 for all other categories.

The average number of care-days per patient was 10.5 for all categories, 8.0 for automobile passengers, 7.8 for cyclists, 14.9 for pedestrians and 11.6 for all other categories.

Incidence according to individual year of age is shown in Table XLIV. In all, 101 patients were treated per 100,000 residents under 15 years of age.

Table XLIV. Number of persons injured in motor-vehicle accidents per 100,000 residents and year, by age and traffic category, Malmöhus County, 1970-1979.

Age in years	Passengers in automobiles	Cyclists	Pedestrians	Others	Total
0	15	0	0	0	15
1	14	4	7	1	26
2	16	3	12	4	36
3	25	8	25	4	63
4	25	31	34	3	93
5	13	67	47	13	140
6	19	62	37	11	130
7	23	48	43	4	118
8	19	33	43	10	106
9	11	51	55	10	128
10	20	41	47	11	119
11	26	47	22	9	103
12	14	49	31	23	117
13	29	46	29	27	131
14	50	50	33	80	214
Total	21	36	31	13	101

The distribution by place of residence, of patients with injuries caused by motor-vehicle accidents, is shown in Table XLV. Using $p = 0.038$, higher than expected frequencies were found in the populations of Helsingborg and Trelleborg, while less than expected were found in Lund-Staffanstorp, taking the age distribution of the populations into account.

Table XLV. Age-standardized ratios for injuries due to motor-vehicle accidents and "p-value" by commune, Malmöhus County, 1970-1979.

Commune	Ratio	p-value
Bjuv	1.26	0.126
Helsingborg	1.21	0.004
Höganäs	0.80	0.175
Landskrona	1.00	0.992
Svalöv	0.83	0.365
Burlöv	0.84	0.339
Kävlinge	0.92	0.604
Lomma	0.96	0.785
Lund+Staffanstorp	0.72	1.0×10^{-4}
Eslöv	0.76	0.061
Hörby	1.43	0.038
Höör	0.81	0.388
Svedala	1.01	0.960
Trelleborg	1.31	0.007
Vellinge	1.23	0.083
Sjöbo	1.04	0.840
Skurup	1.24	0.228
Ystad	0.91	0.564

Similar tests were carried out for automobile passengers (limiting p-value = 0.062), where Helsingborg ($p = 0.024$) had higher than expected frequencies, and Höganäs ($p = 0.029$) had lower than expected. For cyclists (limiting p-value = 0.088), higher than expected frequencies were found in Svedala ($p = 0.032$), Trelleborg ($p = 1.0 \times 10^{-4}$), and Vellinge ($p = 1.0 \times 10^{-5}$), while fewer than expected were found in Lund-Staffanstorp ($p = 0.001$). For pedestrians (limiting p-value = 0.123), more than expected were found in Helsingborg ($p = 1.0 \times 10^{-4}$), while fewer than expected were found in Lund-Staffanstorp ($p = 0.007$) and in Svedala ($p = 0.019$).

Discussion

During the 1970's about 1,100 care-days each year were attributable to children from Malmöhus County with injuries due to motor-vehicle accidents. Data for the nation indicate that this kind of accident accounts for nearly half of all treated, traffic injuries in children of 1 to 14 years of age (19). Bicycle accidents are responsible for the majority of remaining traffic injuries (69). Injury and death rates due to traffic accidents have diminished in Sweden during recent years (70). This improvement has not, however, been shared by all age and traffic categories. Improvement has occurred among child pedestrians, but children as automobile passengers are still subject to about the same risk of injury as 10 years ago. The majority of younger victims of traffic accidents are automobile passengers. Increased and proper use of safety belts and baby-seats could prevent many accidents (71).

Not all serious traffic accidents result in admission to hospital. About 2/3 of those killed in traffic accidents have already died at the scene of the accident or during transport to a hospital, and are therefore not admitted as patients (72). Lesser injuries may not require inpatient treatment, but can be cared for on an outpatient basis. Still lighter injuries may not even require contact with the medical services. For this reason, inpatients constitute only a small proportion of traffic-accident victims. They do, on the other hand, constitute the most seriously injured, except for those who died before reaching hospital. Incidence varies greatly among the various age and traffic categories. As a basis for preventive measures, therefore, the material should always be analyzed by sub-groups. The most obvious result of comparison by communes, is the appreciable excess among pedestrians from Helsingborg. The same result was also found in a special analysis of statistics from Malmöhus County, showing the number of dead and injured in motor-vehicle accidents reported by police ($p = 1.0 \times 10^{-9}$) (personal communication, 1981). One explanation may be that Helsingborg is the largest urban community in the county.

Treatment time is longer for pedestrians than for other traffic categories. The same result is shown in a study from New Zealand (73).

Traffic-accident reports by police are the usual source when estimating incidence of traffic injuries. However, not all accidents come to the knowledge of the police. It is assumed that practically all traffic fatalities are reported to the police, while about half of other serious injuries are reported (74). In a study carried out at the Linköping Regional Hospital, the

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hospital statistics showed that injuries to children on bicycles were under-reported in the police registers; only about 5 percent of such injuries came to the knowledge of the police (75).

Several other studies have shown that statistics about traffic accidents are inadequate, regarding both light and serious injuries. Under-reporting affects primarily the "unprotected party" (76). There is thus a great need to exploit the information contained in registers maintained by the medical service organizations, in order to improve the observation of trends among traffic-accident cases.

Recently, a report was published on traffic accidents in Sweden based upon an analysis of discharges from hospitals (77). When such material also includes data on outpatient visits, the number of light injuries which require contact with the health services can be calculated.

V GENERAL DISCUSSION AND CONCLUSIONS

The overall purposes of the present study have been to carry out an evaluation of how effectively existing statistical systems within the health-service organization of one county council can be used in support of health planning, and to provide suggestions for the continued development of the statistical systems on a basis of practical experience.

Evaluation of the systems was carried out with one specific objective in mind: to lay a foundation for planning. No comprehensive evaluation of the systems in wider context was intended; an ambition which would have required the presentation of many other aspects of the systems, such as production costs and reliability, etc. Such comments and conclusions as are presented, as a result of the study, must therefore be weighed against the other uses, for which the systems are intended. The main use of the systems, hitherto, has been to provide a basis for various administrative routines. Demands upon the planning base have increased with the introduction of the new legislation on health and medical care: a factor which should be taken into account in the continued development of the systems.

Different kinds of information can be required in the planning base. Statistical systems within the health organizations are just one of many sources that can be used. Others are, for example, the cause-of-death register, sociological studies, etc. The sources must be correctly selected for each planning process.

The present study takes up just one of the several sources and does not, therefore, provide an evaluation of the total planning base. However, it should be possible to compare the results of this study with those obtained from other sources, when discussing the future development of various types of systems.

It is surprising, in fact, that analyses of this type have not yet been used to greater extent. Available examples of individual-based studies, aided by this type of system, are still rare in Sweden. The most comprehensive examples are one study of inpatient care in the Uppsala Medical District, 1965-1968 (41), and studies of outpatients from Tierp (57, 78) and Dalby (10, 58).

In the section on international trends, it was pointed out that individual-based registers are now being developed in many countries. As in Sweden, the development is more advanced in the field of inpatient care, compared with outpatient. Since statistical systems in the health and medical areas are more advanced in Sweden than in many other countries, the prospects for their use should be favorable.

One explanation of why the effort thus far has been so limited, may be found in the fact that established epidemiology in Sweden has not hitherto sufficiently exploited the possibilities of descriptive studies of the kind that can be obtained from this type of system. Such studies could very well provide one of the most important sources for maintaining a continual and current picture of health problems in the population. Recent legislation may lead to greater use of the statistical systems. If so, the methodologi-

cal questions taken up in this study may contribute to an improved and more precise usage of the systems.

The study presents data on the consumption of health services and occurrence of illness. The primary objective has been to evaluate the information base and methods by means of comparisons with the findings in other studies.

Different processing methods can lead to different results. Data on patient contacts can be used to throw light on the consumption of medical services, but occurrence of illness can only be described after conversion of contact statistics into statistics on illness episodes and new cases. This distinction has been consistently followed. Results may deviate from reality in spite of precautions, but they should nevertheless provide a useful starting point for continued investigation.

During the course of the study, such extensions have been initiated in several areas: for example, a study into the occurrence of diabetes in Landskrona and Ystad, and another study into the excess of acute myocardial infarctions reported from Burlöv and Landskrona.

This study can also be seen in another broad perspective, in relation to gradual changes in health-planning procedures which took place during the 1970's. Resource planning has more and more taken into account the needs of the population for health and medical services, instead of simply referring to various norms. One logical consequence of this process leads to a health and medical care organization, that is highly attentive to health risks and their means of prevention. This idea is fundamental to the new legislation on health and medical services (1).

Quality of the statistical systems

This study investigates the quality of the statistical systems to the extent that they are of significance in providing a basis for planning. Quality may be affected by incorrect information, loss of data, various registration procedures and diagnostic criteria, along with inadequate agreement between registered information and real conditions.

Errors and losses are difficult to avoid in large and current computer systems of the kind in question here. There are procedures within the systems, however, which counteract these problems. The proportion of patient contacts having incomplete or incorrect registrations of person-number has diminished in recent years. Registrations of age and sex are thereby improved. A 9-percent sample of inpatients disclosed that 6.9 percent of care episodes in 1977 had been without complete person-number, but only 3.8 percent in 1979. The number of such outpatients was 3.3 percent in 1979, but only 1.4 percent in January-October, 1981. Mistakes in person-number are improbable if the number is complete, provided that the checking routines are used in the computer processing. This is now standard for inpatients but not for outpatients.

Registration procedures should not differ among the various providers of care. For such concepts as visit and care episode, relatively clear defini-

tions are in use, and since the registrations form the basis for economic transactions, such data should be quite accurate. Of those variables appearing in the present study, the most uncertain is postal code. Postal code is obtained from the patient's own information and is frequently incorrect. Numbers of households in the various communes is also at variance with information based on postal-code areas by 0.1 to 16.0 percent.

It is imperative that other methods be found for registration of place of residence, since the geographical apportionment of medical care consumption and occurrence of illness is an important instrument of planning. By transferring information from the population register to the systems, rather than registering separately for each contact, place of residence can be more accurately established.

Increasing exploitation of the systems can also lead, ultimately, to an increased demand for improved procedures to reduce the amount of error and loss of data.

In studies of consumption of services and occurrence of illness, the medical diagnosis is the one variable in the statistical systems, that can be used to illuminate the nature of various health problems. In order for diagnosis to be a useful device, there must exist a well functioning and uniform system of classification. Since the statistical systems include the entire diagnostic panorama and all types of care as well, it is difficult to meet this requirement. For inpatients there is a long-established classification system (ICD, or International Classification of Diseases). This can also be used with outpatients, but for some kinds of outpatient care, particularly outside of hospital, where a clear and specific diagnosis may be difficult to assign, the ICD code may be correspondingly difficult to use. A special classification system for outpatient care has therefore been introduced in Sweden (36), an abstract of ICD-8, including the most commonly occurring diagnoses and reasons for visit at non-hospital units. The list also includes a number of codes for symptoms.

The statistical systems now use ICD-8 (35). In some cases, however, diagnosis of outpatients has been registered according to the classification for outpatients. Since the Swedish version of ICD-8 is a 5-digit number, the 3- or 4-digit codes in the outpatient classification are filled out with zeros, to make up a 5-digit code. Material containing information according to both classifications cannot, therefore, be processed at the 5-digit level. This problem can be partially solved if the outpatient codes are given another notation in the 4th and 5th positions, such as "XX". This provisional solution should be used, pending results of discussions now in progress, which should lay the foundation for decisions on future standards.

In Sweden, work is now in progress, with a view to the data needs of non-hospital medical services. Classification systems from different parts of the world are described and commented upon in one review of the data base in non-hospital services (79).

The code list for outpatient care (36) can be used together with ICD (35). This is to great advantage when coordinating all records of patient contact in a population group, regardless of contacted facility. If, as in the present

study, one wishes to investigate the occurrence of otitis media, material must be processed from both hospital and non-hospital sources. The computer processing is more complicated if one has to deal with different coding systems. The problem is capable of technical solution, but makes demands for continual and precise checking of codes originating from the various care units. Material covering longer time periods must be processed with full attention to coding changes which may have occurred during the interval.

In studies of consumption of services and occurrence of illness, made for planning purposes, there are good reasons to process materials from inpatient and outpatient sources simultaneously. One illness episode may well include both types of contact. This is also facilitated, if uniform classification schemes are used. Certain problems may otherwise arise. If treatment procedures are changed in such a way that a certain illness is transferred from hospital to non-hospital services, and if the outpatient registration places the illness in a group, together with other illnesses, it then becomes impossible to follow trends of that illness in time. In the study, this is illustrated by the example of acute upper respiratory infection of multiple or unspecified sites (ICD 465), which is common in outpatient care (Table XV) but is included in a group together with acute nasopharyngitis (ICD 460) and acute pharyngitis (ICD 462). At the same time, these diagnoses appear individually in the registration of inpatients. In 1970, 101 care episodes were registered under ICD 465, compared with 122 in 1979, an increase of about 20 percent. During the same period, however, the number of cases registered under ICD 460 and 462 diminished from 175 to 60, perhaps depending upon the transfer of such cases to non-hospital units. With these diagnoses collected together in a group, in the outpatient classification, the study of changes between outpatient and inpatient care is made more difficult.

The advantages inherent in a unified classification system must, however, be weighed against the practical consideration of its adequacy as an instrument for program planning, and for the identification of health problems in the population. Primarily in the non-hospital services, it may be difficult to plan medical programs on the basis of the distribution of diagnoses. The problem that caused the patient to seek help cannot always be assigned a medical diagnosis. In this case, a simultaneous classification of reason for contact might be suitable. In order to identify health problems in the population, a classification of social problems is needed, as well.

The ICD code works better with specialist services than with non-hospital services, since the specialist units are usually dealing with a limited scope of diagnostic categories, in contrast with the non-hospital services, where problems are seen, representing the entire diagnostic panorama, and it is naturally difficult to apply the comprehensive list making up the ICD. At some units, this problem has been solved with the help of condensed "memory-aids", containing codes for the most commonly occurring problems.

This study has not included any investigation into possible variations among the various services as to criteria used in the assignment of diagnosis. The results of the regional distribution of acute myocardial infarction have

shown, however, that such differences probably have not occurred in this diagnosis, since this probably would have led to equal frequencies arising in all communes being served by a single hospital, and such was not the case. In breast cancer as well, there was no regional pattern that could be attributed to the location of hospitals. The question of varying diagnostic criteria cannot be decided in connection with diabetes or traffic injuries, because treatment procedures may be different regarding referral to outpatient or inpatient care. This means that conclusions cannot be drawn on the basis of inpatient sources alone.

Even allowing for possible future changes in the classification system, variations in criteria for the assignment of diagnostic codes must be expected between different doctors and different units. It is therefore important to verify conclusions reached on the basis of the statistical systems, by processing other statistical sources in parallel. Acute myocardial infarction can be cited as an example from the present study, where the regional pattern should be verified against the cause-of-death register.

Through the sharpening of criteria for the assignment of certain diagnoses, and through the use of comparisons with other registers, the statistical systems are capable of providing a significant instrument in studies of consumption of services and occurrence of illness. For the future, it is important to strive for the highest possible quality of data. To achieve this end, a unity of purpose will be needed between those responsible for data registration and those responsible for its analysis. This goal can best be achieved, if the analysis can be carried out in cooperation with personnel in the respective program areas or geographical districts.

It is not necessary that maximal quality be maintained at all times in all registrations; it is entirely possible to sharpen the demands for quality during specific time periods, for the populations of specific areas, for certain categories by age and sex, or for certain categories of illness. These should be selected on the basis of their importance to the administering organizations as resource planning aids and for the recognition of health problems.

Contact patterns in time

Any long-term analysis of trends in the contact pattern (and occurrence of illness) is inevitably subject to certain difficulties. Methods and criteria for the assignment of diagnosis may change, especially in the case of "soft" diagnoses, such as those applied to various psychosomatic and psychiatric illnesses. Problems of "delay-time" may also arise in relating changes to conditions in society. It may take a long time for societal change to make itself evident in the contact and illness patterns. But the illness pattern can, nonetheless, to some extent mirror the times we live in, so that continual registration and analysis can act as sensors of social conditions.

The present study has reported the trends found in connection with diagnoses, commonly encountered in somatic, inpatient care, during a 10-year period. The main impression is that the pattern is relatively stable, but also that the number of care episodes per inhabitant is diminishing in a

number of diagnoses, for the population under 45 years of age, and is increasing in some diagnoses, for the population older than 45 years. Changing treatment procedures may possibly account for such decreases as those found, for example, in asthma, hypertrophy of tonsils and adenoids, induced abortions, and concussion. Admission to hospital may have been replaced by treatment in outpatient units. Changes in the way of life may also explain certain increases, such as those involving diseases of the circulatory organs. It is possible, however, that some such differences can be explained by changes in registration procedure, as in acute myocardial infarction, for example.

Regression analysis was used in the study to examine trends during a 10-year period. The method has been used previously to study changes in the consumption of outpatient services at a medical center (10). The method can be applied in the planning process for health and medical care. By relating frequencies to the underlying population, it becomes possible to project trends for the planning period, on the basis of population forecasts. Such calculations are easily prepared with the aid of a programmable calculator, in which current population data have been stored on a suitable medium, such as magnetic tape cartridge. The tendency of results to vary greatly among the various age groups, together with the changing age structure in the population, make it necessary that analyses be carried out with the age distribution in mind.

Definition of illness episodes

By care contact, we mean here a visit or a care episode. This is not the same concept as an illness episode. A patient may have more than one visit or care episode in connection with a single illness. It is consequently necessary to define which care contacts with the patient are to be regarded as belonging to the same illness, when estimating incidence or prevalence. The study contains several illustrations of how results may be influenced by the choice of alternative methods. The number of care episodes, distributed geographically, for breast cancer, diabetes, and acute myocardial infarction, yield an entirely different pattern, compared with that obtained from the distribution of occurrences of the respective diseases. This resulted from the varying admission procedures at different hospitals. Comparisons of trends and between age groups are similarly affected, which can be illustrated by the diagnosis, breast cancer. During the period 1975-1979, the number of care episodes increased, while the number of new cases remained nearly constant. The number of care episodes increased because procedures for admission were changed. During the same period, women in the age group 45-64 years showed a larger rise in number of care episodes, compared with other age groups. This is interpreted as evidence that the procedural changes had their greatest effect upon women in this age group.

Another example can be found in the comparison of visits with illness episodes due to otitis media. When the number of visits in the age group 0-9 years is compared by sex, it is found that boys had 19 percent more visits than girls. The number of illness episodes, however, is only 12 percent more. Thus, boys had more visits per illness episode than girls. If one then uses visits as an expression for the occurrence of the illness, a greater difference between the sexes will be found than actually exists.

This problem can be counteracted by allowing each person to contribute only one care contact to the calculations. But even then, the great problem remains of selecting a suitable time interval for study.

If one decides to study the occurrence of an illness under, for example, a one-year period, the following situation may occur. In some chronic conditions, such as diabetes, it may be that care contacts occur infrequently, not even once a year. Prevalence of the disease will then be underestimated. Or it may happen that different population groups have different contact patterns. If one age group has contacts every other year, while another has denser contacts, apparent differences arise, which do not correspond to reality. It is then necessary to process material covering time periods that are sufficiently long to eliminate this effect.

In studies of short-term illness, there are other sources of error. A patient may contract the same disease more than once, which is not reflected in the calculations. This factor may also vary between population groups, thereby yielding incorrect results for comparisons of occurrence between the groups. Comparisons of occurrence for short- and long-term illnesses may also lead to a relative under-estimation of the chronic ailment.

The problem is further complicated when one considers recurrences of the same disease, for example in acute myocardial infarction. The measurement of new cases per calendar year on the basis of one contact per person, may cause the rates for one year to be influenced by rates of the preceding year. An example can be cited involving two population groups. During a given year, 100 persons in each group develop the disease, while in the following year, 120 new cases arise in one group but only 100 in the other. If recurrence of the same illness occurs in 40 percent of cases during the year after onset, then a further 40 persons will be counted in each group as new cases during the second year. This gives a total of 160 and 140 persons, respectively, and a ratio between groups of 1.14, even though the true ratio is 1.20. Thus, the absolute frequencies are wrong and the changed relationship between groups in the second year is interfered with in the statistics.

One means for meeting this problem is to try to restrict the care contacts per person to a given illness episode. One then finds that the same limits are not appropriate to all diseases, but also that the limits are not self-evident. Even if they can be decided on medical grounds, it is sometimes necessary to consider other than purely medical criteria. If, for example, one regards a person with myocardial infarction as an infarction patient over a long period of time, then the relationship between onset and other factors, such as the social environment, is less accessible. These difficulties are independent of the type of registration used. A new cancer in the same breast as before is regarded in the tumor register as recidivous, while a cancer in the other breast is regarded as a new case.

Experience from the comparative study with the tumor register shows that the County Council's statistical systems do not replace this type of register. It is simply not possible to keep the systems current over such long periods as are necessary in order to obtain a complete record of care contacts for chronic conditions. The statistical systems might possibly be useful in the epidemiological surveillance of chronic diseases. This assumes

that each care contact for certain illnesses be checked out against earlier information in the system (disease-specific sub-registers), to determine whether or not the patient is already registered.

Therefore, the best opportunities that the statistical systems offer for epidemiological studies, lie perhaps more in the direction of studies of dynamic populations than in the study of cohorts. This offers an excellent opportunity for the non-hospital services to follow, in a simple way, the illness patterns in their current underlying population. This of course eliminates the possibility of estimating incidence of diseases, which continue over a long period of time, such as malignant neoplasms, rheumatoid diseases and diabetes. It should still be possible to estimate prevalence of chronic diseases. For the study of diseases running a faster course, incidence rates should remain relatively unaffected by geographical mobility in the populations of the various local jurisdictions.

Geographical differences

A number of geographical comparisons that have been tested statistically are presented in the study. It is, of course, not certain that all differences which show a statistical significance are matched by real differences in occurrence of disease. The differences can sometimes be explained by other factors. It has been shown, for example, in earlier planning processes in Malmöhus County, that the number of care contacts increases, the closer one lives to the care unit (80). Populations in communes with a hospital had more contacts per inhabitant than did the populations of other communes.

In a report issued in 1974, it was already noticed that "possible differences between various districts can be the result of differences in accessibility of medical resources, in medical procedures, capacity differences, or differences in frequencies of diseases." In another study of one outpatient district, the consumption of services varied according to the distance to the medical center (10).

Besides these factors, the number of contacts can also be influenced by attitudes in the population toward seeking care, which in turn may be determined by the level of awareness and knowledge, ethnic and cultural background, and socio-economic circumstances. Many of these factors may be evident in the geographic comparisons of occurrence of diseases. In order to meet these problems, it is appropriate to extend the examination of findings already made. Material from the statistical systems provide a base in which to look for indicators of such differences as may exist.

In this study it has been found that breast cancer is neither over- nor under-represented in the various communes. Differences are found between communes, on the other hand, in the diagnosis of acute myocardial infarction. Here it is possible to compare a commune with high occurrence with another having low occurrence, in order to search for environmental factors that may contribute to the occurrence of the disease. This is one of the questions, in which answers have been sought by various WHO register studies (81). One may also suppose that on-going efforts toward the registration of disease occurrence in various population groups, and discus-

sions of the findings, will eventually provide evidence on the relevancy of the statistical material, thereby leading to an increased confidence in findings of over- or under-representation or of changing trends. At the same time, it is possible to make comparisons with information from other registers or sources, such as standard-of-living studies, cause-of-death registers, and registers of sick-leave (11).

Similarly, the results should be judged not only in relation to the health and medical care systems, but also in relation to other societal systems (82). Needs can be met outside the health care system and conditions in society can be reflected in the consumption of medical services and the occurrence of disease.

In this study the geographical breakdown has been made at commune level. At the same time, the possibility has been mentioned of obtaining a more detailed breakdown by means of coordinates. In this connection, it is important to point out that if the information is to be of value in local health programs, then the comparison of occurrence data with reference values from larger areas should be made using a breakdown that is in agreement with the administrative boundaries. If national agencies break down their material at commune level, making comparisons between commune and nation, while the regional agencies (county councils) are breaking their material down at a level below commune, making comparisons between sub-communal areas and the region, the result will be that local variations can go unnoticed. The entire area (county or commune) can fall within the accepted limits of variation. Reference values should therefore be set for geographical areas in relation to the next higher jurisdictional level.

The discovery of clusters that extend across geographical boundaries, or of other aggregations of rare diseases, requires the use of alternative geographical breakdowns. This is also the case when comparing areas with different characteristics, e.g. degree of urbanization.

Planning of health- and medical-service resources and their allocation can be made more effective with the help of geographical investigations into the occurrence of disease and consumption of services. In one study a model is presented, in order to illustrate some areas in which epidemiological thinking can be applied to health services research (83). Mention is made of the need for health care services, the use of health services, the impact of health programs on utilization patterns and on health status, and the impact of therapeutic services on outcomes for specific diseases. Description and follow-up in these areas, for various population groups, can perhaps become an instrument of planning, when the non-hospital services have accepted full responsibility for the health status of the population within their jurisdiction.

For breast cancer, the study shows that PAS (inpatient) in its present form provides an adequate base for the estimation of prevalence, and thereby also of the need for resources. Most of these patients are admitted for inpatient care and the number of patients treated during a given time-interval can therefore be calculated. However, material covering several years is necessary for the inclusion of patients who return for further treatment after a long interval.

The statistical systems do not provide a solid basis for the estimation of incidence, since the illness may recur after a long interval. It is statistically permissible to define the disease as "new" if it has not led to medical contact during a certain period, even though in most cases this will not agree with the medical definition. The method can be applicable as a basis for planning, since trends and differences between population groups should be amenable to study, without the method having different effects on different occasions. Another way to estimate incidence is to begin with the number of persons receiving care during a certain time-period and, from this information, approximate the proportion made up of new cases during the period.

Since special registers already exist for the registration of tumors, there is no reason to use the statistical systems to this end. Reporting to the tumor registers can possibly be combined with registration in the statistical systems. This can be of interest if specific registers are created for other diseases besides cancer, in which event the statistical systems can be regarded as a base for the collection of primary information about the contacts of patients with the medical services.

For diabetes, the statistical systems make it possible to study prevalence. This assumes that systems exist for both inpatient and outpatient services, and that diabetes is registered as a supplemental diagnosis when the patient is treated for some other condition. For the population of Ystad Commune, PAS (inpatient) was processed for a 7-year period and PAS (outpatient) for a 1-year period. Since many of these patients are elderly and may die during so long an interval, the material had to be compared with the current population register.

Incidence of this disease cannot be studied using the present statistical systems. One possibility is therefore to establish special registers of the type already maintained by the Regional Tumor Registry. Such registers could be so designed that upon each patient contact with this diagnosis, a check would be made to determine whether or not the patient was already known in the register with the same disease. If unknown, then supplemental information could be obtained through special routines and transferred to the specific register.

Another method for the measurement of incidence is to carry out retrospective studies of the medical records, starting from identifying information in the statistical systems. This has the objection, however, that it is difficult to relate the material to an original cohort.

Otitis media is an illness that may lead to multiple contacts with the medical services. The material in PAS (outpatient) is sufficient to allow the study of incidence, on the condition that registration is carried out at all units visited by the population. The necessary definitions for distinguishing between first and return visits during a single illness episode are not satisfactory, however. The terms, new and return visit, are inadequate because they refer only to the patient's contact with specific units. The problem can be solved if a special notation is made for return visit, as a complement to the diagnosis number. The ICD codes are not adequate, since the supplementary code, which can be used when the patient is not ill, does not allow for the registration of the fact that the visit is for check-up, in consequence of a specific illness. Diagnostic data are needed, even in the case of return visits, for studies of the consumption of services.

Another method for the definition of new cases, is to determine a statistical time limit between visits. In a draft health program at the ear clinic of the hospital in Lund, a recurring inflammation after more than 1-month's interval is defined as a new inflammation. A recurring inflammation within 1 month of the original presentation is defined as the same inflammation (personal communication, 1982).

For acute myocardial infarction, the incidence can be determined on the basis of information from PAS (inpatient). If this information is supplemented by information on deaths outside hospital, the material is more reliable. It is also necessary that care episodes after a defined interval can be defined as a new illness episode. In this study the limiting interval between discharges was selected at one calendar year. This was a significantly longer interval than that used in a study in Stockholm, which was based upon a register similar to that in Malmöhus County. In that study, a limit of 28 days was used between admissions to hospital for acute myocardial infarction, to determine whether or not it was a new attack (84).

A suitable time limit should be decided upon for future studies. Criteria for the determination of diagnosis should also be discussed, as shown in a study from Gothenburg (64).

The estimation of prevalence of asthma requires information from both PAS (inpatient) and PAS (outpatient). Since this illness can be difficult to define, there is a need for well thought out criteria when comparing materials for populations seen at different care units. Since the materials must cover at least a 1-year period, it is worthwhile to verify that the registered patient actually resided in the area during the period in question.

From a registration standpoint, rheumatoid arthritis should be processed in the same way as diabetes. In this case, however, it is also important to remember that a case-finding program influences the time at which the disease is discovered. This should be taken into account when comparing prevalence data from different areas.

In the case of injuries due to motor-vehicle accidents, the study has demonstrated the value of the statistical systems when used as a complement to the police registrations, which in some instances reflect a

different distribution of injuries due to various kinds of accident. Only about half of all serious injuries are reported to the police and under-reporting varies between the different traffic categories.

Different procedures for the care of the injured can influence the accuracy of the analyses, for which reason materials from both inpatient and outpatient sources should be processed simultaneously. Customized codes should also be used for the registration of where and how the accident occurred. Such information can be used as the basis for preventive programs. It is important that the material be processed for various sub-groups, since the reasons for different accidents may vary among the various age and traffic categories.

Evaluation of the usefulness of the statistical systems

The statistical systems, in their present form, provide a relatively effective tool for routine surveillance over the use made by the population of the health and medical services, altogether and in relation to various diagnostic groups. While the systems make it possible to carry out individual-related studies, their currently available routines must be augmented with extensive manual operations. Manual checks, for the correction of incomplete or incorrect person-numbers, are also required in some cases. A further difficulty arises, when the material is to be related to the underlying populations of various geographical areas, in that the systems' information about place of residence is unreliable, particularly for outpatients, and is not always in agreement with administrative jurisdictions. Improved reliability should be achieved by linking the material to the population register.

A technical problem in processing arises because the material is primarily arranged by care unit. Outpatient material is stored by medical district, and both inpatient and outpatient materials are stored by year. This is a cause of extra effort when summarizations are required over longer time periods, or for population groups whose medical contacts may be spread across several medical district boundaries.

The study also shows that the statistical systems can be used to estimate the incidence and prevalence of various diseases. Since not all illnesses lead to contact with the medical services, these estimates must be used primarily for comparisons between different population groups and trends in time. Those applications, which have been selected in the study, show also that different methods of calculation must be used for different illnesses. Through appropriate design of method and rigorous distinction between new and recurring illness, a higher degree of reliability can be achieved in the results. Where the registration of outpatient diagnoses has been introduced, it has become possible to analyze several disease-groups that do not normally appear in the inpatient system but are usually seen in the outpatient system.

In the present study, geographical comparisons of occurrence of illness have been restricted to materials obtained from inpatient sources. This is due to the fact that diagnostic information is not yet available from all outpatient units. When that stage has been reached, it will be possible to

make similar comparisons for illnesses commonly seen at the outpatient units.

Medical information in the systems is very limited. With the large masses of data, collected in the statistical systems, it is not reasonable to expect as high a degree of reliability in the registration of medical information as that demanded by the tumor registry. For this reason it is unsuitable to collect comprehensive medical information in these systems as a basis for future studies, e.g. of the course of illness.

General suggestions

Inpatient sources were given priority in the statistical systems used by the Malmöhus County Council. The registration of outpatient data was started because it was technically easy and was needed to replace manual procedures. The reason for the earlier registration of inpatient care was that this was then regarded as the heavier part of the burden on the health service organization. Assumptions have changed, since priority has been shifted to the outpatient services. At the same time, there is a growing insight into how the statistical systems should work in the outpatient field, e.g. through the programs in Dalby and Tierp. Work is also under way on the question of what basic data should be registered regarding outpatient care.

In the future development of the statistical systems, it will perhaps be advantageous to establish one, unified system for both outpatient and inpatient care. For the purposes of epidemiological studies, it is of little interest to know whether or not the patient stayed overnight. As a basis for the study of consumption of services, there would be the same possibility of counting visits, care episodes, and care-days in a coordinated system as is now the case with the separate systems, the only requirement being that notation be made of dates of visit, admission, and discharge.

From the present study it can be concluded that if the statistical systems are to be used as a planning base, there must be continual and complete registrations. Through the continual registration of patient contacts, it is possible to study trends in time and the occurrence of specific diseases. Examples in the study show that such studies may require access to material covering several years' experience. Complete coverage is required for the successful capture of information, for certain population groups, about patient contacts at the various local, provincial and regional units. It would also be an advantage, if the systems could include data from outside the public health services. Private practitioners and company doctors are examples of sources, where significant information could be collected for the estimation of occurrence of disease. The planning of public services can also be facilitated, if the activities of other providers of care are taken into account.

The size of the statistical systems means that their information should be limited. The following variables should be regarded as fundamental requirements in relation to demands now made on the planning base.

Person-number and name are needed to identify the patient. Collation with the population register requires the use of name, when the person-number is not complete. Person-number provides information concomitantly on age and sex.

Information about the patient's place of residence should be retrieved from regional population registers. But since some patients may not be resident within the region, the patient's address should also be registered. This information can also be of value in checking against the population register when person-number is incomplete.

Information about the date of contact is necessary for studies of consumption of services, but also for the identification of discrete episodes of illness.

Identification of care unit is necessary for studies of consumption of services, e.g. in the form of distribution of contacts between the various units and types of units.

Information about the provider of services is needed in studies of how consumption is distributed among personnel categories. Regardless of whether or not this information is registered, clear definitions are needed as to which patient contacts should be registered.

These variables identify the patient and the care-providing unit (and/or person). Some medical information is also required, of which medical diagnosis is the most important in the study of occurrence of disease.

Certain other variables should not be registered routinely for all contacts, without prior discussion as to their intended use. If further information, such as occupation, national origin, civil status, etc. are desirable in studies of the consumption of services or the distribution of occurrence of diseases in different groups, then one should first determine whether the information is available from the population register. It is an advantage if the information can be found in the population register, since it is then possible to relate statistical summaries from the systems to the entire population. It can otherwise be difficult to determine whether or not a particular disease is over-represented in some particular group, e.g. occupational group.

It may also be necessary to register certain information during a definite time period, for certain diseases, for certain population groups, or for certain care-providing units. The statistical systems should therefore make provision for "local" codes, as is now the case in Malmöhus County.

This study shows that the occurrence of disease can be estimated on the basis of the statistical systems, to the extent that the disease leads to contact with the health services. The definition of illness episode is a difficult problem in processing. Earlier attempts have shown that it is difficult to find a computer-technical solution, even for a single care-providing unit (10). Results from another study have shown that it is frequently inappropriate with standardized routines for the statistical delimitation of illness episodes (19).

Further work is therefore needed, in order to determine which statistical delimitations are appropriate for different diseases.

These suggestions entail, for Malmöhus County's part, linkage to the population register, the selective collation of material from both inpatient and outpatient sources for defined population groups, the capacity to process materials covering longer periods than one calendar year, the registration of names of outpatients, and the provision for "local" codes for other groups than specific care-units, e.g. for certain diseases.

Simpler procedures are needed for gaining access to information by person-number, which at present requires approval by the chief medical officer at each care-providing unit. Permission by the district's chief medical officer, covering processing of material from several units, should be sufficient.

Flexible computer programs are also needed, which can accommodate a number of different statistical definitions of the time delimiter in studies of illness episodes. This can be expressed in terms of individuals with medical-care contacts due to a given illness, such that no previous contact has been registered during a specified time interval.

Finally, there should be provision for the establishment of disease-specific registers.

VI CONCLUDING REMARKS

Computer based systems for the registration of contacts in inpatient and outpatient care have existed for several years at the Malmöhus County Council. Since public medical care accounts for the greater part of medical care in Sweden, these registrations cover the majority of patients' contacts with the health care organization.

This study was carried out in order to investigate the usefulness of the data systems as tools for health planning. This kind of planning requires population- and individual-related data. The systems can provide such data but their primary purpose is to give production-related data. They have not been created primarily for the purpose of reflecting health consumption and occurrence of illness in the population. This was evident in the amount of manual effort that had to be performed in order to handle the information supplied by the computer.

The systems can serve both purposes after appropriate modifications. There should be changes in the fields of data input, the storage of data, programs for handling the information, and supplementation from other sources. This can only be accomplished if there is a long-term program in the health organization, which can counteract the general tendency to favor production analytical goals at the expense of epidemiological goals. Nor should it be forgotten that technical development of the systems is not a primary goal as such, but must always be weighed against the usefulness of the systems.

In brief, this evaluation of the statistical systems demonstrates that:

- the systems provide a basis for health planning through studies of consumption of services and occurrence of illness
- the quality of the data ought to be raised, especially for information about place of residence and diagnosis
- the systems allow information to be linked with the help of person-number
- methods for the linkage of information must be specifically designed for different diseases
- linkage with the population register is possible, and would be of even greater value if coordinates were used
- sub-registers should be created for certain chronic diseases
- supplemental information should be obtained from other sources, e.g. the cause-of-death register and private practitioners
- data must be processed and analyzed in such a way that the information is relevant to the questions stated, because misleading calculations may otherwise arise

- observations of statistical difference should be followed up by further investigation and interpreted with scientific impartiality, discipline, and caution.

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